Technical Training

Catalog

HOLT CAT San Antonio & Irving Texas Locations

Revised October 15, 2015

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This training catalogue includes the course descriptions for technical training, as well as operator training. Custom courses can be designed to meet specific training needs.

General Information

GENERAL INFORMATION

Introduction

This catalogue contains course descriptions, prerequisites, duration, as well as the required equipment needed for class.

Enrollment

For schedule or enrollment inquiries, please call one of the friendly HOLT ProTech Training Coordinators:

Vanessa Johnson
(210) 648-8420
Vanessa.Johnson@HoltCat.com

Kaley Carbonaro
(972) 721-2846
Kaley.Carbonaro@holtcat.com

You may also access the current Holt ProTech course schedule on our website at www.HoltProTech.com.

Please have a PO# or Credit Card # ready at the time of enrollment. A confirmation of enrollment will be sent out, and then 6 weeks prior to class starting, a class memo with further details will be sent.

Hotel Lodging

When enrollment is made, please state if hotel lodging is needed. Both of the HOLT Caterpillar Regional Dealer Learning Centers in San Antonio and Irving use a hotel that offers HOLT customers a special rate. Additional lodging information is available upon request.

Safety Equip.

Appropriate uniforms/clothing must be worn to class. Safety glasses and leather shoes must be worn in the shop when participating in an active lab. Students without the proper safety equipment will not be allowed to participate in the lab activities. See the course descriptions for additional specific equipment that may be required.

Fees

The weekly per person fees are $1950 without hotel or $2400 with hotel. The daily rate per person is $390 per day without hotel and $480 per day with hotel. Both fees include: technical course, handout materials, and lunch. Invoicing is prepared each week. Substitutions are allowed without penalty. (See Customer Cancellation Policy below for specifics).

Classes

Classes are generally from 8:00 am to 4:00 pm. Weeklong classes may vary:

- Monday thru Thursday 8 am – 4 pm and Friday 8 am – 12 Noon,

or

- Monday thru Friday 8 am – 4 pm

Continued on next page

GENERAL INFORMATION, continued

Caterpillar Certified Courses

HOLT ProTech uses the Caterpillar Dealer Performance Center (DPC) to register course attendees in to Caterpillar certified courses. There is a $250 subscription fee for the twelve-month online DPC subscription. Caterpillar requires that all students enrolled in Caterpillar certified courses by enrolled using the Caterpillar DPC registration system. Caterpillar non-certified courses do not require DPC registration.

An added benefit of the DPC is that course attendees are also enrolled in the Customer Campus of the Caterpillar online Dealer Performance Center (DPC) system. The Customer Campus on the Caterpillar DPC system has more than 140 online technical courses that are available 24/7. The $250 online DPC subscription is good for an entire year.

Customer Cancellation Policy

In the event a student must cancel a class reservation, we kindly request a two week notice. If proper notice is not given within two weeks, the student will be assessed a no-show fee of $450 (one-time charge, not per day). If the class is cancelled due to low enrollments or instructor illness, no fees are assessed.

Where a special class is scheduled by HOLT ProTech and multiple students cancel, a $450 per person cancellation fee will be assessed.

In the event your employees cannot attend class, you always have the option to send another qualified person in place of the person who cannot attend. Please notify our Training Coordinator about this replacement as soon as you are aware of the change.

Certification

After each successful class completion, students are given a “Certificate of Completion” and a student report card is sent to supervisors.

Irving Registration Form

FAX TO: **ProTech Training**
MAIL: HOLT CAT
2000 East Airport Freeway
Irving, TX 75062

PHONE: 972-721-2846
FAX: 972-721-2860
E-MAIL: Kaley.Carbonaro@HoltCat.com
CONTACT: Kaley Carbonaro

DATE: _____

CUSTOMER NAME _____

CUSTOMER ADDRESS _____

CUSTOMER PHONE: _____ E-MAIL ADDRESS: _____

PAYMENT INFORMATION

HOLT ACCOUNT NAME: _____ PURCHASE ORDER #:_____

CREDIT CARD #:_____ THREE-DIGIT SECURITY #: _____

NAME ON CARD: _____ EXPIRATION DATE: _____

CITY _____ STATE _____ ZIP CODE _____

PHONE # _____ EXT _____ FAX # _____

CONFIRM TO: _____ E-MAIL ADDRESS: _____

COURSE INFORMATION

Course Code: _____ Location: _____ Course Date: _____

Course Title: _____

PARTICIPANT INFORMATION

Participant: (Please state the exact name the participant will want listed on certificate.)

First Name: _____Middle: _____ Last Name:_____

HOTEL INFORMATION

We are currently reserving rooms at the MCM Elegantė Hotel Suites, 2330 West Northwest Highway, Dallas, TX 75220. The hotel telephone number is 214-351-4477. Please complete the section below if a room is needed.

Will a room be needed? Yes ____ No ____

Non-Smoking _____ Smoking _____

Arrival Date _____

Departure Date _____

TRANSPORTATION INFORMATION

Will transportation be needed to-and-from class? Yes ____ No ____

San Antonio Registration Form

FAX TO: **ProTech Training**
MAIL: HOLT CAT
3302 South W. W. White Road
San Antonio, TX 78222

PHONE: 210-648-8420
FAX: 210-648-8894
E-MAIL: Vanessa.Johnson@HoltCat.com
CONTACT: Vanessa Johnson

DATE: _____

CUSTOMER NAME _____

CUSTOMER ADDRESS _____

CUSTOMER PHONE: _____ E-MAIL ADDRESS: _____

PAYMENT INFORMATION

HOLT ACCOUNT NAME: _____ PURCHASE ORDER #:_____

CREDIT CARD #:_____ THREE-DIGIT SECURITY #: _____

NAME ON CARD: _____ EXPIRATION DATE: _____

CITY _____ STATE _____ ZIP CODE _____

PHONE # _____ EXT _____ FAX # _____

CONFIRM TO: _____ E-MAIL ADDRESS: _____

COURSE INFORMATION

Course Code: _____ Location: _____ Course Date: _____

Course Title: _____

PARTICIPANT INFORMATION

Participant: (Please state the exact name the participant will want listed on certificate.)

First Name: _____Middle: _____ Last Name:_____

HOTEL INFORMATION

We are currently reserving rooms at The Holiday Inn Express, 2027 SE Loop 410 San Antonio, TX. The hotel telephone number is 210-648-0016. Please complete the section below if a room is needed.

Will a room be needed? Yes ____ No ____

Non-Smoking _____ Smoking _____

Arrival Date _____

Departure Date _____

TRANSPORTATION INFORMATION

Will transportation be needed to-and-from class? Yes ____ No ____

Technical Training Catalog

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Course Title . . . . . Challenger MT200

Code: TA29

Length . . . . . 3 Days

Description: This course is designed for the service technician. This course will identify the components and describe the operation of the operator station, power train, three-point hitch, power take-off, electrical system, engines, steering system and the implement hydraulic system on the MT200 Series of Challenger.

Skills/Topics taught:

Upon completion of this course, the Service technician will be able to locate and identify the major parts of the tractor systems and:

- Operator station
- Engine compartment
- Drivetrain
- Implement system
- Electrical system
- PTO and steering
- Three-point hitch
- Maintenance locations and test points
- Trace oil flow through the hydrostatic drive and implement systems
- Safely operate the Challenger MT200 series Ag. tractor

Prerequisites:

- A general understanding of Ag. tractors

Required equipment:

- Safety glasses with side shields, safety (or hard-toed) shoes are required.
- Appropriate work clothing is required.

Course Title . . . . . .Challenger MT400

Code: TA31

Length . . . . . 3 Days

Description: This course is designed for the Ag Service Technician. This course will identify the components and describe the operation of the operator station, power train, three-point hitch, power take-off, electrical system, engines, steering system and the implement hydraulic system on the MT400 series of the challenger

Skills/Topics taught:

Upon completion of this course, the service technician will be able to locate and identify the major points, power flow and be able to function these tractor systems:

- Operator station
- Engine compartment
- Drivetrain
- Implement system
- Electrical system
- PTO and steering
- Three point hitch
- Maintenance locations and test points
- Safely operator the challenger MT400 series Ag Tractor

Prerequisites:

- The student should have a general understanding of AG Tractors

Required equipment:

- Safety glasses with side shields, safety (or hard-toed) shoes are required.
- Appropriate work clothing is required.

Course Title . . . . . .Challenger MT 500/600

Code: TA32

Length: . . . . . 3 Days

Description: This course is designed for the Ag. Service technician. It will introduce the technician to basics of the advanced features and systems of the new Challenger tractors. The component location, function, calibration, testing and adjusting of the machine systems will be covered. The tractor monitoring system will be covered and explained.

Skills/Topics taught:

Upon completion of this course, the technician will be able to:

- Locate and identify the components of the major machine systems
- Explain the operation of the major systems
- Explain the tractor monitoring system
- Perform the calibrations, test, and adjustments of the major systems
- Perform diagnostics of the major machine systems to the correct system faults

Prerequisites:

- Electricity (TG01)
- Hydraulic Systems (TM28)

Required equipment:

- Safety glasses with side shields, safety (or hard-toed) shoes are required.
- Appropriate work clothing is required.

Course Title . . . . . Challenger MT700/800

Code: TA28

Length: . . . . . 3 Days

Description: This course is designed for the Ag service technician. It will introduce the technician to basics of the advanced features and systems of the new Challenger tractors. The component location, function, calibration, testing and adjusting of the machine systems will be covered. The tractor monitoring system will be covered and explained.

Skills/Topics taught:

Upon completion of this course, the technician will be able to:

- Locate and identify the components of the major machine systems
- Explain the operation of the major systems
- Explain the tractor monitoring system
- Perform the calibrations, test, and adjustments of the major systems
- Perform diagnostics of the major machine systems to the correct system faults

Prerequisites:

- Electricity (TG01)
- Hydraulic Systems (TM28)

Required equipment:

- Safety glasses with side shields, safety (or hard-toed) shoes are required.
- Appropriate work clothing is required.

Course Title . . . . . Lexion Combine

Code TA27

Course Length . . . . . .4 ½ Days

Description:

This presentation discusses the major components, features, and operation of the Propel System, Brake System, Final Drives, Mobil-trac System, Header and Feederhousing, Threshing and Separation Units, Sieves and Cleaning System, Straw Chopper and Chaff Spreader, Hydraulic System, Electrical System, Control Center, and Engines Drivers.

Skills/Topics taught: Upon completion of this course of study, the participant will be able to:

- Locate and identify the major components in the brake, propel system, final drives and undercarriage
- Trace the oil flow through the brake and propel system
- Explain the operation of the brake and propel system
- Test brake and propel system
- Explain the procedures for de-tensioning and tensioning of the tracks on 465 and 485 machines
- Locate, identify and adjust the major components of the header and feederhousing, thrashing and separation units, sieves and cleaning system and straw chopper and chaff spreader
- Access data from the CEBIS or IMO electronic systems, harvest recorder and COPP program
- Identify and locate the major components of the hydraulic system
- Explain and test multi-tasking, pressure and volume sensitive design, and shock absorbing system and low-pressure hydraulics
- Locate and identify the following systems, engine cooling system, air intake, power belt system and automatic tensioning

Prerequisites:

- Hydraulic Systems (TM28)
- Electricity (TG01)

Required equipment:

- Safety glasses with side shields, safety (or hard-toed) shoes.
- Appropriate work clothing is required.

Course Title . . . . . Lexion Combine Refresher

Code TA33

Course Length . . . . . .1 Day

Description:

This class is designed for an annual refresher for technicians that have completed the standard course

Skills/Topics taught: Upon completion of this course of study, the participant will be able to:

- Brakes and propel system
- High pressure hydraulic system
- Low pressure hydraulic system
- Headers and feeder systems
- Thrashing system
- Separation system
- Cleaning system
- Grain return system
- Clean grain system
- Unloading system

Prerequisites:

- Lexion Combine (TA27)

Required equipment:

- Safety glasses with side shields, safety (or hard-toed) shoes.
- Appropriate work clothing is required.

Course Title . . . . . Row Crop Challenger

Code TA24

Course Length . . . . . 3 Days

Description:

Classroom work will include basic concepts of load sensing, pressure compensation and differential steering. Systems covered include transmission, steering, implement brake boost, mobil-trac, three-point hitch, and the performance monitor.

Skills/Topics taught:

Participants should be able to:

- Locate the major components and test points
- Follow schematics
- Explain, calibrate, test and troubleshoot the machine systems

Prerequisites: Participants attending this course should have successfully completed:

- Electricity (TG01)
- Hydraulic Systems (TM28)

Required equipment:

- Safety glasses with side shields, safety (or hard-toed) shoes are required.
- Appropriate work clothing is required.

Course Title . . . . . Row Crop (Till Diagnostics)

Code TA26

Course Length . . . . . 3 Days

Description:

This course will cover advanced systems operation and diagnostic procedures of the electrical system. Classroom time will be spent discussing circuits, which are not covered by fault codes and introduction to the Challenger Technician program on Laptop computer. The majority of the lab time will be spent diagnosing problems on the tractors utilizing on board diagnostics and the Laptop computer.

Skills/Topics taught:

Upon completion of this course, the participant will be able to:

- Understand the operation of the electrical systems
- Be able to trace those systems on the schematic
- Be able to use the on board diagnostics and DVOM and Service Manual to diagnose Fault Codes
- Be able to analyze Electrical system symptoms to diagnose problems without fault codes
- Be able to use the Laptop computer and Challenger Technician to diagnose tractor problems

Prerequisites:

- Row Crop Challenger (TA24)

Required equipment:

- Safety glasses with side shields, safety (or hard-toed) shoes are required.
- Appropriate work clothing is required.

Course Title ..... **Articulated Dump Trucks**

Code **TM20**

Course Length ..... **4 Days**

Description:

This course is designed to prepare a participant to work on Caterpillar Articulated Dump Trucks. The participant will locate and identify power train hydraulic system, implement hydraulic system and steering hydraulic system components. The participant will also be able to test and adjust components in these systems. The participant will also be able to locate, identify program and diagnose problems in the Electronic Transmission Control.

Skills/Topics taught:

- Given the appropriate service manual module, locate the power train hydraulic system components.
- Given the appropriate service manual module, perform all the power train hydraulic system tests.
- Given a machine, identify the Transmission Electronic Control input and output components.
- Given a machine, read and interpret the diagnostic displays on the ALL ECM's.
- Given a machine, locate and identify the implement, steering, and suspension components.

Prerequisites:

- Hydraulic Systems (TM28)
- Electricity (TG01)
- Power Trains (TM40)

Required equipment:

- Safety glasses with side shields, safety (or hard-toed) shoes are required.
- Appropriate work clothing is required.

Course Title . . . . . **Advanced Backhoe Loader Operator Training**

Code **TO10**

Course Length . . . . . **4 ½ Days**

Description: This course is intended for the individual who has the basic skills of operating a Backhoe Loader. Throughout this course, the following information will be taught.

- The safety hazards associated with Backhoe Loader operations
- Backhoe Loader operating techniques

Skills/Topics taught:

Upon completion of this course, the participants will be able to perform the following:

- Reasons for practicing job safety
- Rules for job safety
- Machine safety
- Setting and reading trench grade, slope ratio, rising and falling grades expressed in %.
- The pre-operation inspection (review)
- Machine start up (review)
- Operating techniques:
    - Loading a truck with the loader bucket and the Backhoe (if trucks are available)
    - Trenching on grade
    - Trenching next to a wall
    - Trenching between objects
    - Backfilling
- Machine parking and shut down

Prerequisites:

- The student should have successfully completed the Introduction to backhoe loader course or have an experience level in the operation of backhoes to pass the **pre-test with a proficiency rate of 80%.**
- Have a basic knowledge of setting and reading grade.

Required equipment:

- Safety glasses with side shields and safety (or hard-toed) shoes are required.
- Appropriate work clothing is required.

Course Title . . . . . Backhoe Loaders

Code TM24

Course Length . . . . . 3 Days

Description: This course will be taught both in the classroom and on the iron. Material will cover machine systems, operations, testing and adjusting.

Skills/Topics taught: Participants should be able to:

- Explain the machine systems
- Test and adjust the engine fuel system, transmission, brakes, electrical, and hydraulic systems

Prerequisites: Participants attending this course should have successfully completed:

- Hydraulic Systems (TM28)

Required equipment:

- Safety glasses with side shields, safety (or hard-toed) shoes are required.
- Appropriate work clothing is required.

Course Title . . . . . **Introduction to Backhoe Loader Operation**

Code **TO06**

Course Length . . . . . **5 Days**

Description: This course is intended for the individual who has little to no experience operating a Backhoe Loader. Throughout this course the following information will be taught, and the individual will have learned the basics of Backhoe Loader operation.

- The safety hazards associated with Backhoe Loader operations
- Becoming familiar with Backhoe Loaders
- Basic Backhoe Loader operating techniques

Upon completion of this course; the participants will be able to describe, or perform, the following.

- The characteristics of a good operator
- Reasons for practicing job safety
- Rules for job safety
- Machine safety
- Basics of setting and reading grade
- The pre-operation inspection
- Machine start up
- Operating techniques, machine set up, digging, trenching
- Machine parking and shut down

Prerequisites:

- A desire to learn the operation of heavy equipment

Required equipment:

- Safety glasses with side shields and safety (or hard-toed) shoes are required.
- Appropriate work clothing is required.

Course Title . . . . . **Diesel Engines Disassembly and Assembly**

Code **DE100**

Course Length . . . . . **3 Days**

Description: This course covers diesel engine theory, operation, systems, components, and their functions through self-study web based prerequisite Caterpillar learning modules available on the Caterpillar Dealer Performance Center (DPC). Participants will be expected to perform key tasks during classroom and lab sessions as presented in the course.

Skills/Topics taught:

Upon completion of this course, the participant will be able to:

- Perform engine disassembly procedures
- Perform engine assembly procedures
- Examine and adjust a C9 Caterpillar Common Rail Engine.

NOTE: Many of the procedures learned on this engine are applicable to other engine families.

<u>Required</u> Prerequisites:

- 28937 – Engine Fundamentals online DPC course
- 41134 – CAT Diesel Engines online DPC course
- 41135 – Diesel Engine Cylinder Block online DPC course
- 41136 – Diesel Engine Cylinder Head Assembly online DPC course
- 40434 – Diesel Engine Valve Train online DPC course
- 40435 – Diesel Engine Camshaft online DPC course
- 40436 – Diesel Engine Crankshaft online DPC course
- 40437 – Diesel Engine Piston Assembly online DPC course
- 41300 – Diesel Engine Front Gear Train online DPC course
- 41301 – Diesel Engine Front Gear Train online DPC course

NOTE: Courses taken online on the Caterpillar DPC website must be completed and each test passed with a minimum score of 80%.

Required equipment:

- Safety glasses with side shields, safety (or hard-toed) shoes are required.
- Appropriate work clothing is required.

Course Title . . . . . **Diesel Engines**

Code **DE101**

Course Length . . . . . **4 ½ Days**

Description: This course covers diesel engine theory, operation, systems, components, and their functions. Participants will be expected to perform key tasks during classroom and lab sessions as presented in the course.

Skills/Topics taught:

Upon completion of this course, the participant will be able to:

- Explain the theory of diesel engines
- Describe the operation of a diesel engine
- Identify system components and their function
- Perform engine disassembly & assembly procedures

Prerequisites:

- None

Required equipment:

- Safety glasses with side shields, safety (or hard-toed) shoes are required.
- Appropriate work clothing is required.

Course Title . . . . . Caterpillar C4.2 – C6.6 Engines

Code DE214

Course Length . . . . . 2 Days

Description:

This course provides an overview of the latest electronically controlled C4.2, C4.4, C6.4, and C6.6 ACERT technology Engines, along with background information on serviceability limits. to Caterpillar C4.2 – C6.6 engine construction, components, and systems.

This course is designed to prepare the participant to identify the components, explain their function, service, and adjust the Caterpillar Common Rail (CCR) fuel system.

Note: 3003 - 3024C, 3034, 3044C, 3046C, 3054 - 3056E engines will be reviewed during this course

Skills/Topics taught: Upon completion of this class, participants should be able to:

- Locate and identify system components
- Properly adjust valve lash following new procedure used on these engines
- Explain the functions of the Caterpillar Common Rail (CCR) fuel system components
- Remove and install Injector
- Time CCR high pressure fuel pump using correct tooling

Prerequisites:

- Electricity (TG01)
- Electronics Troubleshooting I (26679)

Required equipment:

- Safety glasses with side shields and safety (or hard-toed) shoes are required.
- Appropriate work clothing is required.

Course Title . . . . . Caterpillar C27 & C32 Diesel Engines

Code DE219

Course Length . . . . . 4.5 Days

Description:

This course pertains to Caterpillar C27 & C32 machine and industrial engines. This course covers construction, systems, and the electronic fuel system used on these engines. A strong emphasis will be placed on the development of the skills necessary to perform special and routine diagnostic and calibration procedures. Participants will be expected to perform key tasks during classroom and lab sessions as presented in the course.

Skills/Topics taught: Upon completion of this class, participants should be able to:

- Use Caterpillar ET and SIS to acquire needed information and perform procedures.
- Calibrate injector timing
- R&I Cylinder Head
- R&I Gear Trains
- R&I Piston & Liner
- Flash ECM
- Copy Configuration files
- Change Customer Configuration files
- Locate correct Flash files and download
- Download and program ACERT injector trim files

Prerequisites: It is recommended that participants complete the following courses:

- Electricity (TG01)
- Electronics Troubleshooting I (26679)

Required equipment:

- Safety glasses with side shields and safety (or hard-toed) shoes are required.
- Appropriate work clothing is required.

Course Title . . . . . **Caterpillar 3116 & 3126 MUI Engines**

Code **DE112**

Course Length . . . . . **.2 Day**

Description: This course pertains to the Caterpillar 3116 & 3126 Mechanical Unit Injector (MUI) engines. A strong emphasis will be placed on the development of the skills necessary to perform special and routine diagnostic and calibration procedures. Participants will be expected to perform key tasks during classroom and lab sessions as presented in the course.

Skills/Topics taught:

Upon Completion of this course the participant will be able to:

- Use Caterpillar ET and SIS to acquire needed information and perform work
- Adjust valves
- Remove and install an injector
- Remove and install an injector sleeve
- Synchronize the injector racks
- Calibrate injector timing
- Adjust fuel setting

Prerequisites:

- None

Required equipment:

- Safety glasses with side shields, safety (or hard-toed) shoes are required.
- Appropriate work clothing is required.

Course Title . . . . . Caterpillar 3126 – C7E Diesel Engines Disassembly & Assembly

Code DE102

Course Length . . . . . 4 ½ Days

Description: This course will teach the participant to identify 3100 MUI and 3126 – C7 HEUI engine components, explain their function and service. It will teach design, maintenance, and repair of both 3100 Mechanical Unit Injector (MUI) and Hydraulically actuated Electronically controlled Unit Injector (HEUI) engines.

Skills/Topics taught:
Upon completion of this class, participants should be able to:

- 3126 MUI & HEUI engine disassembly & assembly procedures
- Remove and install in injectors using the correct tools and procedures
- Synchronize mechanical unit injector
- Calibrate mechanical unit injector timing
- Make fuel setting adjustments on MUI engine
- Locate and identify major components of the HEUI engine
- Use a computer and CAT "Electronic Technician" to retrieve diagnostic information
- Use a computer and CAT "Electronic Technician" to retrieve engine parameters
- Use a computer and CAT "Electronic Technician" to Flash engine ECM

Prerequisites:

- None

Required equipment:

- Safety glasses with side shields and safety (or hard-toed) shoes are required.
- Appropriate work clothing is required.

Course Title . . . . . **Caterpillar 3500 Diesel Engines**

Code **DE220**

Length: . . . . . **4 Days**

Description: This course pertains to Caterpillar Diesel 3500 series mechanical and electronic unit injector engines. This course covers construction, systems, and the mechanical & electronic fuel systems used on these engines. A strong emphasis will be placed on the development of the skills necessary to perform special and routine diagnostic and calibration procedures. Participants will be expected to perform key tasks during classroom and lab sessions as presented in the course.

Skills/Topics taught:

Upon completion of this course, the participants should be able to identify, describe, or perform the following:

- Use Caterpillar ET and STW to acquire needed information and perform procedures.
- Adjust valves
- Remove and install an injector
- R&I Cylinder Head
- Calibrate injector timing
- Adjust valve lash
- Locate correct Flash files and download
- Flash ECM
- Copy Configuration files
- Change Customer Configuration files
- Adjust fuel setting
- Test / troubleshoot electronic components and systems

Prerequisites: It is recommended that participants complete the following courses:

- Electricity (TG01)
- Electronics Troubleshooting I (26679)

Required equipment:

- Safety glasses with side shields, safety (or hard-toed) shoes are required.
- Appropriate work clothing is required.

Course Title . . . . . Electronics Troubleshooting I

Code 26679

Course Length . . . . . 4 ½ Days

Description: This course consists of a WBT and Hands-On component. Intended for Caterpillar service technicians, this course will familiarize the learner with specific electrical/electronic troubleshooting and repair techniques to supplement information covered in the WBT component of this training. Topics include diagnosing electrical/electronic concerns, demonstrating diagnostic procedures, and repair techniques. This program is intended for Caterpillar Service Technicians who have completed the WBT prerequisite component of this course. This Hands-On component allows Caterpillar Service Technicians to practice and demonstrate lessons learned throughout this course. This component focuses on the inspection, service, and equipment required to perform electrical/electronic repairs.

Skills/Topics taught: Upon completion of this class, participants should be able to:

- Assemble electrical circuits on a training aid and measure electrical circuits using a DMM
- Identify basic components and apply Ohms Law to solve unknown circuit valves
- Identify and service connectors
- Diagnose basic circuit faults
- Navigate and interpret schematics
- Successfully flash an ECM using ET
- Identify inputs and outputs and measure their signals
- Explain pull-up voltage and its function in a circuit
- Use service resources to correctly troubleshoot diagnostic codes and diagnose input/output faults
- Use service resources to correctly diagnose battery, starter, and alternator faults

Continued on next page

Prerequisites:

- Electricity (TG01) – **Required**

  OR the following DPC courses can be taken

- ELE C01 - Key Features of Electricity - Minimum score: 85 (Required)
- ELE C02 - Electrical Schematics - Minimum score: 85 (Required)
- ELE C03 - Measuring Electrical Circuits - Minimum score: 85 (Required)
- ELE C04 - Electrical Circuit Types - Minimum score: 85 (Required)
- ELE C05 - Electrical Circuit Faults - Minimum score: 85 (Required)
- ELE C06 - Wire Connectors - Minimum score: 85 (Required)
- ELE C07 - Wire Types, Terminals and Harnesses - Minimum score: 85 (Required)
- ELE C08 - Circuit Devices - Minimum score: 85 (Required)
- ELE C09 - Circuit Protection Devices - Minimum score: 85 (Required)
- ELE C10 - Electrical Motors - Minimum score: 85 (Required)
- ELE C11 - Semi-Conductors - Minimum score: 85 (Required)
- ELE C12.1 - Electrical Circuit Inputs: Switches - Minimum score: 85 (Required)
- ELE C12.3 - Electrical Circuit Inputs: Temperature and Pressure Sensors - Minimum score: 85 (Required)
- ELE C12.4 - Electrical Circuit Inputs: Speed/Timing Sensors - Minimum score: 85 (Required)
- ELE C13 - Circuit Processors - Minimum score: 85 (Required)
- ELE C14 - Circuit Outputs: Components - Minimum score: 85 (Required)
- ELE C15 - Battery System - Minimum score: 85 (Required)
- ELE C16 - Starting System - Minimum score: 85 (Required)
- ELE C17 - Charging System - Minimum score: 85 (Required)

Required equipment:

- Safety glasses with side shields and safety (or hard-toed) shoes are required.
- Appropriate work clothing is required.

Course Title . . . . . Caterpillar Electronic Unit Injector Engines

Code DE307

Course Length . . . . . 4 ½ Days

Description: This course pertains to Caterpillar 3176, 3406E, C-10, C-12, C11, C13, C-15, C15, and C18 machine and industrial engines. This course covers construction, systems, and the electronic fuel system used on these engines. A strong emphasis will be placed on the development of the skills necessary to perform special and routine diagnostic and calibration procedures. Participants will be expected to perform key tasks during classroom and lab sessions as presented in the course.

Skills/Topics taught: Upon completion of this class, participants should be able to:

- Use Caterpillar ET and STW to acquire needed information and perform procedures.
- Adjust valve lash
- Calibrate injector timing
- Calibrate the speed-timing sensors
- Flash ECM
- Copy Configuration files
- Change Customer Configuration files
- Locate correct Flash files and download
- Download and program ACERT injector trim files

Prerequisites: It is recommended that participants complete the following courses:

- Electricity (TG01)
- Electronics Troubleshooting I (26679)

Required equipment:

- Safety glasses with side shields and safety (or hard-toed) shoes are required.
- Appropriate work clothing is required.

Course Title . . . . . Caterpillar Medium Duty Electronic Engines

Code DE306

Course Length . . . . . 3 Days

Description: This course pertains to Caterpillar 3116, 3126, C7, and C9 HEUI & Caterpillar Common Rail (CCR), ACERT engine construction, components, and systems. This course is designed to prepare the participant to identify the components, explain their function, service, and troubleshoot the Hydraulic Electronic Unit Injection (HEUI) fuel system. Participants will be expected to perform key tasks during classroom and lab sessions as presented in the course.

Skills/Topics taught: Upon completion of this class, participants should be able to:

- Locate and identify components of the HEUI systems
- Explain the functions of the HEUI system components
- Locate and identify components of the CCR systems
- Explain the functions of the CCR system components
- Remove and install injector sleeve.
- Remove and install injector
- Perform Injector solenoid test
- Perform cylinder cut-out test
- Perform injection actuation pressure test
- Perform speed-timing sensor calibration
- Use a computer and CAT Electronic Technician to retrieve diagnostic information.
- Use a computer and CAT Electronic technician to retrieve engine parameters.
- Flash an Electronic Control Module (ECM)
- Copy / change configuration files
- Download & program ACERT injector trim files
- Knowledge of Caterpillar Diesel Particulate Filter (DPF)
- Knowledge of Caterpillar Regeneration System (CRS)
- Knowledge of Caterpillar Clean Gas Induction (CGI) system
- Knowledge of Caterpillar Auxiliary Regeneration Device (ARD)

Prerequisites: It is recommended that participants complete the following:

- Electricity (TG01)
- Electronics Troubleshooting I (26679)

Required equipment:

- Safety glasses with side shields and safety (or hard-toed) shoes are required.
- Appropriate work clothing is required.

Course Title . . . . . Tier 4 Interim Engine & Aftertreatment Systems Diagnostics

Code . . . . . Course is available ONLY to Caterpillar Dealer Personnel 33994

Course Length . . . . . 5 Days

Description: The Tier 4 Interim Engine and Aftertreatment Systems Diagnostics course is intended for Cat Dealer service training instructors, technical communicators, and service technicians. This course focuses on Cat solutions to meet EPA Tier 4 Interim, EU Stage IIIB, and equivalent Japan MLIT nonroad diesel engine emissions regulations. This course provides advanced systems operation information with an emphasis on hands-on diagnostic and repair techniques. Topics include the air systems, aftertreatment, fuel systems, selective catalytic reduction, engine to aftertreatment connection requirements, and the operator interface

Skills/Topics taught: After completion, the participant will be able to:

- Locate and identify selected Tier 4 air, fuel, and aftertreatment components during lab exercises. Diagnose, troubleshoot, and repair selected air, fuel, and aftertreatment failures during lab exercises.
- Demonstrate the procedure for removing ash from the DPF. Identify the various safety procedures associated with servicing the aftertreatment system. Utilize and understand the Cat Electronic Technician service tests associated with the air, fuel, and aftertreatment systems during lab sessions. Correctly time the high-pressure fuel pump and remove and install a high-pressure supply line/quill tube and injector on a Tier 4 common rail engine.
- Troubleshoot and repair failures associated with Tier 4 common rail and MEUI-C fuel systems. Identify safety and cleanliness concerns associated with a common rail fuel system. Demonstrate the procedure for adjusting the injector height on a MEUI-C injector. Identify incorrect installation and demonstrate correct installation of the Tier 4 Interim flex-pipe assembly. Identify and describe the function of the air system components used on the C4.4 ACERT, C6.6 ACERT, and C7.1 ACERT. Explain the function of the components in the SCR system to include the dosing control cabinet, mixer, DOC, catalyst units, DEF injection system, and electronic components. Identify and explain the function of each component used for high temperature and low temperature regeneration. Explain the rationale for multiple operator warning increments as the soot level increases in the DPF. Identify and explain the function of the lights and switches that are included in the regeneration system operator interface.

Required Prerequisites:

- Tier 4 Interim Systems Overview – Service online DPC Course
- Tier 4 Interim Aftertreatment – Service online DPC Course
- Tier 4 Interim Air Systems – Service online DPC Course
- Tier 4 Interim Regeneration Strategy – Service online DPC Course
- Tier 4 Interim Regeneration Operator Interface – Service online DPC Course
- Introduction to Tier 3 ACERT™ Technology Part 1 online DPC Course
- Introduction to Tier 3 ACERT™ Technology Part 2 online DPC Course **(all in CAT's DPC)**
- Electronics Troubleshooting I (26679)

Required equipment: Students should bring safety glasses, safety shoes, and appropriate work clothes. **A LAPTOP COMPUTER IS REQUIRED with the latest version of E.T.**

Course Title . . . . . .Tier 4 Final Emissions Systems Diagnostics

Code . . . . . . Course is available ONLY to Caterpillar Dealer Personnel **. 42223**

Course Length . . . . . 4 Days

Upon completion of this course, the participant will be able to properly troubleshoot, diagnose, and determine the root cause(s) of failures of the Cat Tier 4 Final emissions systems.

Description:

The Tier 4 Final Emissions Systems Diagnostics course is intended for Cat Dealer service training instructors, technical communicators, and service technicians. This course focuses on Cat solutions to meet EPA Tier 4 Final and EU Stage 4 nonroad diesel engine emissions regulations. This course provides advanced systems operation information with an emphasis on hands-on diagnostic and repair techniques. Topics include the air systems, aftertreatment, fuel systems, selective catalytic reduction, and the operator interface.

Learning Objectives:

Navigate SIS Web and demonstrate use of selected service publications in a lab exercise. Identify the functionality and perform selected operations within Cat ET while connected to a Tier 4 Final engine in a lab exercise. Summarize the function and troubleshoot various NOx Reduction Systems (NRS) in a lab exercise. Summarize the function and troubleshoot various regeneration systems in a lab exercise. Summarize the function and troubleshoot various fuel systems in a lab exercise. Describe DEF composition, safety concerns, storage requirements, and perform DEF concentration test in a lab exercise. Summarize the function and troubleshoot the SCR System in a lab exercise. Describe the function of the operator warning system and explain the operator inducement strategy.

Prerequisites:

1. Tier 4 Interim Knowledge Assessment (**Required**)
2. Tier 4 Final C1.5 and C2.2 Systems Overview (**Required**)
3. Tier 4 Final C7.1 to C18 Engine Systems Overview (**Required**)
4. Tier 4 Final Operator Interface Warnings & Inducements (EPA) (**Required**)
5. Tier 4 Final C4.4 ACERT and C7. ACERT Engine Overview (**Required**)
6. Electronics Troubleshooting I (26679)
7. Tier 4 Final Technology Sales Overview (Recommended)
8. Selective Catalytic Reduction (SCR) and Diesel Exhaust Fluid (DEF) Sales Overview (Recommended)

Required Equipment:

- **Laptop computer with most current version of ET and SIS access**
- Safety glasses with side shields and safety (or hard-toed) shoes are required
- Appropriate work clothing is required

Course Title . . . . . ADEM III for G3500

Code TE119

Course Length . . . . . 3 Days

Description: This course is customized to meet the needs of the gas compression industry for Caterpillar G3500 ADEM III Control Systems. This course introduces the students to the ADEM III control system and all the associated hardware. The effective use of the relevant Caterpillar service literature/schematics will be practiced. Instruction will include time spent on an operating G3508 ADEM III engine using ET, and proper CAT procedures to set the power valve using the emission analyzer will be followed.

Skills/Topics taught:

Upon completion of this course, the participant will be able to:

- Understand the operating principles of Caterpillar ADEM III Gas Engine Controls
- Understand the electrical principles of the ADEM III control system
- Understand wiring diagrams and symbols
- Understand the importance of the power valve and its proper setting
- Understand the proper use of the emission analyzer

Prerequisites:

- Student must have a working knowledge of a G3500 Gas engine
- Basic Electricity

Required equipment:

- Appropriate work clothing is required.
- Laptop with ET (Electronic Technician) software is highly recommended.

Course Title . . . . . **Gas Engine Electronics**

Code **TE123**

Course Length . . . . . **4 Days**

Description: This course is designed to acquaint the participant with the electronics used in Caterpillar engines. The class will provide the participant with a solid foundation for attendance at Gas I class.

Skills/Topics taught:

Electrical Principles will first be reviewed. Upon completion of this course the participant will be able to:

- Understand the troubleshooting techniques for electronic devices.
- Use the correct tooling to successfully troubleshoot systems and components.
- Explain the icons and the use of digital multimeters and other test equipment for solid state electronics.
- Understand Caterpillar wiring diagrams and symbols.
- Trace circuits using wiring diagrams and understand the different types of diagrams used.
- Understand the sensors and actuators used with commercial engines.
- Understand the operation of solid state devices and electrical signals.

Prerequisites:

- None

Required equipment:

- Safety glasses with side shields, safety (or hard-toed) shoes are required.
- Appropriate work clothing is required.

Course Title. . . . . Gas Engines I
(G3300, G3400 Stoichiometric & Lean Burn Gas Engine Principles)

Code 13-2900

Course Length . . . . . 5 Days

Description: This is a basic introductory course that covers the fuel, exhaust and ignition systems representative of Caterpillar stoichiometric gas engines. A portion of the class time will be spent doing tests and adjustments on running G3306 or G3412LE Gas Engines.

Skills/Topics taught:

After completion, the participant will be able to:

- Understand the operating principles of Caterpillar Gas Engines.
- Understand the effect of temperature and altitude on developed horsepower.
- Understand the high heat value (HHV) and low heat value (LHV) of fuels.
- Understand the effects of fuel BTU content.
- Determine the proper gas pressure and set the main pressure regulators accordingly.
- Disassemble, assemble and adjust a main pressure regulator and Impco carburetor.
- Check and properly adjust carburetor linkage.
- Determine the effect of turbochargers, aftercoolers and waste gates on engine performance
- Understand how to set the operating pressure of the adjustable waste gate.
- Detailed discussion on preventive maintenance of gas engines.
- Install and time an Altronic III magneto.
- Troubleshoot the ignition system.
- Understand the approximate horsepower of a stoichiometric engine from the “absolute” manifold pressure.
- Connect and use an exhaust-free oxygen analyzer.
- Become aware of the effect of methane number on engine timing and performance.

Prerequisites:

- Diesel Engines (DE101) **– Highly recommended, but not required**.

Required equipment:

- Safety glasses with side shields, safety (or hard-toed) shoes are required
- Appropriate work clothing is required.

Course Title . . . . . **Gas Engines II**

Code **TE84**

Course Length . . . . . **5 Days**

Description: This course reviews stoichiometric gas engine operating principles and the special considerations necessitated by lean burn, low emission gas engines and their associated electrical systems. Specifically G3400 and G3500 Lean Burn, LE Gas Engine configurations will be presented. The associated wiring and control systems will be reviewed with particular attention paid to DC Electrical principles, sensors, wiring schematics, troubleshooting with a DVOM, tests and adjustments with the DDT and the Electronic Technician program using a laptop computer.

Skills/Topics taught:

After completion, the participant will be able to:

- Determine the effect of turbochargers, aftercoolers, and waste gates on engine performance.
- Understand and demonstrate how to read Caterpillar schematics.
- Demonstrate how to troubleshoot the electrical system using a DVOM.
- Check and properly adjust actuator and carburetor linkages.
- Connect and use an exhaust analyzer to set exhaust emissions.
- Demonstrate the proper use of Gas Engine Digital Diagnostic Tooling (DDT) for setup, timing and troubleshooting analysis.
- Understand how the Caterpillar Air/Fuel ratio control works on a Lean Burn G3500 Engine.
- Understand the operation of Engine Status Control Module (SCM) and its role in engine protection.
- Understand the role of the Caterpillar Electronic Ignition System (EIS) and how to troubleshoot it.
- Connect, use and understand the Electronic Technician program using a laptop computer.

Prerequisites:

- Gas Engines I (13-2900)
- Gas Engine Electronics (TE123) - **Highly recommended, but not required.**

Required equipment:

- Students should bring safety glasses, safety shoes, and appropriate work clothes.
- Recommend student complete Basic Electricity training booklet (SEBV0534) prior to attending class.
- Recommend the student bring a calculator and a DVOM to class.

Course Title ……..… G3300B
Code ……... TEG33
Course Length ……...…… 4 Days

Description: This course covers the G3300B emissions system and A4-E2 electronic controls system. Emphasis will be placed of systems operation, testing, adjusting, and diagnostics. Each training module includes a presentation and lab exercise.
Skills/Topics Taught: Upon completion of this course, the participants will be able to:

- Identify the emissions and electronic controls components
- Use ET and Messenger Panel for Configuring Parameters
- Use GERP Software for Fuel and Ignition System set-up
- Test and Diagnose the Emissions System Electronic Controls
- Test and Adjust the post-catalyst NOx and CO emissions
- Test and Diagnose the A4-E2 Electronic Control System
- Test and Diagnose the CAN Data Link System
- Test and Diagnose the Caterpillar Remote Messenger Panel

Prerequisites: Before attendance, it is recommended that the participant already has the basic knowledge and understanding of DC electronics, Voltmeter usage, Voltage drop, and Gas engine principles. If not, it is recommended that the participant completes the following courses:

- Gas Engine Electronics (TE123)
- Gas Engines I (13-2900)

Required Equipment:

- Safety glasses, side shields, work shoes or boots, and appropriate work clothing. No shorts and no sandals allowed in class or lab.

Course Title . . . . . Advanced Excavator Operator Training

Code TO11

Course Length . . . . . 4 ½ Days

Description: This course is intended for the individual who has the basic skills of operating an Excavator. Throughout this course, the following information will be taught.

The safety hazards associated with Excavator operations
Excavator operating techniques

Skills/Topics taught:

Upon completion of this course, the participants will be able to perform the following:

- Reasons for practicing job safety
- Rules for job safety
- Machine safety
- Setting and reading slope ratio, and rising and falling grades expressed in %, Trench grade
- The prep-operation inspection (review)
- Machine start up (review)
- Operating techniques:
    - Trenching to grade
    - Working from a high face
    - Building ramps
    - Working in confined areas
    - Working in unstable soils and Mud (Discussion)
- Machine parking and shut down (review)

Prerequisites:

- The student should have successively completed the Introduction to Excavator course or have an experience level in the operation of Excavators to pass the
- pre-test with a proficiency rate of 80%.
- Have a basic knowledge of setting and reading grade.

Required equipment:

- Safety glasses with side shields, safety (or hard-toed) shoes are required.
- Appropriate work clothing is required.

Course Title . . . . . Medium Series Excavators

Code TM73

Course Length . . . . . 3 Days

Description: This course focuses on Medium Series Excavators (336 04 349) and covers the arrangements, components, systems, and functions.

Skills/Topics taught:

Upon completion of this course, the participants should be able to identify, describe, or perform the following:

- Location of valves and components
- Operation of all components
- Flow of oil through the systems
- Testing and adjusting of all components
- Location of all pressure connections
- Troubleshooting techniques
- Required tooling

Prerequisites: Participants attending this course should have successfully completed:

- Hydraulic Systems (TM28)
- Electricity (TG01)

Required equipment:

- Safety glasses with side shields, safety (or hard-toed) shoes are required.
- Appropriate work clothing is required.

Course Title . . . . . Mini Excavator

Code TM57A

Course Length . . . . . .1 Day

Description: This course identifies the components and describes the operation of the power train hydraulic system, brake hydraulic system, steering hydraulic system, implement hydraulic system and the hydrostatic drive electronic control system. The Mini Excavator course discusses the basic design characteristics and machine systems including component location and function. Hydraulic systems operation and maintenance points are also covered.

Skills/Topics taught:

Upon completion of this course, participants will be able to:

- Locate and identify the major components in the operator's station, power train, machine hydraulic systems, undercarriage and engine.
- Check fluid levels in the engine, power train and machine hydraulic systems.
- Trace oil flow through the hydrostatic drive and implement hydraulic systems.
- Explain the operation of each system.
- Explain the function of the major components in the operator's station, undercarriage, engine and hydraulic system.
- Locate and identify the maintenance locations and test points.

Prerequisites: Participants attending this course should have successfully completed:

- Hydraulic System (TM28)

Required equipment:

- Safety glasses with side shields, safety (or hard-toed) shoes are required.
- Appropriate work clothing is required.

Course Title ..... **Small Series Excavators**

Code **TM71**

Course Length ..... **4 Days**

Description: This course covers the 320 and 336 Series Excavators introduction, arrangements, components, systems, and functions.

Skills/Topics taught:

Upon completion of this course, the participants should be able to identify, describe, or perform the following:

- Location of valves and components
- Operation of all components
- Flow of oil through the systems
- Testing and adjusting of all components
- Location of all pressure connections
- Troubleshooting techniques
- Required tooling
- Calibrations of pumps with flow meter

Prerequisites: Participants attending this course should have successfully completed:

- Hydraulic Systems (TM28)
- Electricity (TG01)

Required equipment:

- Safety glasses with side shields, safety (or hard-toed) shoes are required.
- Appropriate work clothing is required.

Course Title . . . . . **Introduction to Excavator Operation**

Code **TO02**

Course Length . . . . . **5 Days**

Description: This course will cover the safety hazards associated with excavator operations, becoming familiar with excavators, and basic earth moving techniques.

Skills/Topics taught:

Upon completion of this course; thee participants will be able to describe, or perform, the following.

- The characteristics of a good operator
- Reasons for practicing job safety
- Rules for job safety
- Machine safety
- Basics of setting and reading grade
- The pre-operation inspection
- Instruments and controls
- Machine start up
- Operating techniques, basic movements, loading and dumping the bucket, basic cutting and filling, ditch digging, techniques for loading trucks
- Machine parking and shut down

Prerequisites:

- A desire to learn the operation of heavy equipment

Required equipment:

- Safety glasses with side shields and safety (or hard-toed) shoes are required.
- Appropriate work clothing is required.

Course Title . . . . . .Large Series Hydraulic Excavators

Code: TM64

Length: . . . . . 3 Days

Description: This course will cover the hydraulic systems and the pump electronic control system for the (374 or 390) class large Hydraulic Excavators.

Skills/Topics taught: Upon successful completion of this course, the technician will be able to:

Describe the operation of the hydraulic pumps.

- Follow the flow of the hydraulic oil through the various systems.
- Connect the test equipment to the hydraulic system and perform hydraulic tests.
- Connect ET to the controller and gather information from it.
- Program the controller through ET or the monitor panel.

Prerequisites:

- Knowledge of the fundamentals of hydraulics and electronic systems.

Required equipment:

- Safety glasses with side shields, safety (or hard-toed) shoes are required.
- Appropriate work clothing is required.

Course Title . . . . . Advanced Service Technician Workbench

Code TG31

Course Length . . . . . 2 Days

Description:

This course is designed for the Caterpillar Field Service Technician. The course will give the technician hands on training in the use of Caterpillar's SERVICE TECHNICIAN WORKBENCH program to be used by the technician in troubleshooting today's sophisticated machine systems.

Skills/Topics taught:

Participants will know:

- Basic computer skills
- Retrieve information from Service Information Systems (SIS)
- Retrieve information from using Electronic Technician (ET)
- Complete work orders
- Troubleshooting using Component Based Troubleshooting (CBT)

Prerequisites:

- None

PLEASE NOTE: You must have a Holt Company of Texas laptop computer to bring to class. SIS and ET will be loaded during the class.

Required equipment:

- Safety glasses with side shields, safety (or hard-toed) shoes are required.
- Appropriate work clothing is required.

Course Title . . . . Machine Maintenance (PM)

Code TG28

Course Length . . . . . 2 Days

Description: This course is designed for the Caterpillar dealer service technician that has demonstrated ability to perform maintenance/repairs on Caterpillar earth moving equipment and/or Caterpillar engines.

Skills/Topics taught:

After completion of this course, the technician will be knowledgeable of how to:

- Use the Operation and Maintenance Manuel
- Service the air intake and exhaust systems
- Service the engine fuel system
- Service the engine cooling system
- Service the engine lubrication system
- Service the engine valve train
- Service the hydraulic system
- Select Lubricants
- Schedule oil sampling (S.O.S.)
- Perform a general inspection of a machine

Prerequisites:

- General working knowledge of Caterpillar products

Required equipment:

- Safety glasses with side shields, safety (or hard-toed) shoes are required.
- Appropriate work clothing is required.

Course Title . . . . . .Electricity

Code TG01

Course Length . . . . . 3 ½ Days

Description: This course is designed for service technicians to gain system knowledge and understanding on Caterpillar electrical systems to enhance troubleshooting skills. These systems include Lighting system, Starting System and Charging System. This course concentrates on the fundamentals of electricity and how electrical systems are used on Caterpillar machines by utilizing classroom instruction and hands on lab activities.

Skills/Topics taught:

- Understanding of Voltage, Amperage, Resistance relationship
- Proper selection and use of voltmeter, Ammeter, Ohmmeter
- Interpretation of Caterpillar Corporate Schematics
- Proper testing and maintenance of batteries
- Proper disassembly, assembly and maintenance of connectors
- Understanding and troubleshooting of the lighting system
- Understanding and troubleshooting of the Starting system
- Understanding and troubleshooting of the Charging system

Prerequisites:

- None

Required equipment:

- Safety glasses with side shields, safety (or hard-toed) shoes are required.
- Appropriate work clothing is required.

Course Title . . . . . Failure Analysis (Engine)

Code: TG05E

Length: . . . . . 4 ½ Days

Description: This course consists of the following Failure Analysis Modules:

- Introduction to Failure Analysis
- Failure Analysis Management
- Principles of Metallurgy
- Principles of Lubrication
- Principles of Wear
- Principles of Fractures
- Visual Examination
- Threaded Fasteners
- Connecting Rods
- Crankshafts
- Engine Bearings
- Pistons, Rings and Liners
- Valves
- Turbochargers

Principles in the modules are illustrated in slide presentations and then reinforced with lab exercises where students analyze actual failed examples. Stereo zoom wide field microscopes, good lighting, TV camera and monitor, etc. are used to ensure micro world facts are observed. Participants will receive a set of color Applied Failure Analysis reference books to take with them.

Skills/Topics taught:

Upon successful completion of this course, the student will be able to:

- Use techniques and procedures to identify most probable root causes of failures
- Communicate with responsible parties and get corrective action to fix products and specific conditions that cause failures

Prerequisites: Recommendation of immediate supervisor, and/or service manager

Required equipment:

- Safety glasses with side shields, safety (or hard-toed) shoes are required.
- Appropriate work clothing is required.

Course Title . . . . . .**Failure Analysis (Gas Engines)**

Code: **TE89**

Length: . . . . . **4 ½ Days**

Description: This course consists of the following Failure Analysis Modules:

- Introduction to Failure Analysis
- Failure Analysis Management
- Principles of Metallurgy
- Principles of Lubrication
- Principles of Wear
- Principles of Fractures
- Visual Examination
- Threaded Fasteners
- Connecting Rods
- Crankshafts
- Engine Bearings
- Pistons, Rings and Liners
- Valves
- Turbochargers
- Gas Engines

Principles in the modules are illustrated in Digital PowerPoint slide presentations and then reinforced with lab exercises where students analyze actual failed examples. Field microscopes, good lighting, Digital Images and Projectors, etc. are used to ensure micro world facts are observed. Participants will receive a Custom Compact Disc of color Applied Failure Analysis reference books to take with them.

Skills/Topics taught:

Upon successful completion of this course, the student will be able to:

- Use techniques and procedures to identify most probable root causes of failures
- Communicate with responsible parties and get corrective action to fix products and specific conditions that cause failures

Prerequisites: Recommendation of immediate supervisor, and/or service manager.

Required equipment:

- Safety glasses with side shields, safety (or hard-toed) shoes are required
- Appropriate work clothing is required.

Course Title . . . . . **Failure Analysis (Machine)**

Code: **TG05M**

Length: . . . . . **4 ½ Days**

Description: This course consists of the following Failure Analysis Modules:

- Introduction to Failure Analysis
- Failure Analysis Management
- Principles of Metallurgy
- Principles of Lubrication
- Principles of Wear
- Principles of Fractures
- Visual Examination
- Threaded Fasteners
- Gears
- Anti-friction Bearings
- Hydraulic Pumps & Motors
- Shafts
- Welds

Principles in the modules are illustrated in slide presentations and then reinforced with lab exercises where students analyze actual failed examples. Stereo zoom wide field microscopes, good lighting, TV camera and monitor, etc. are used to ensure micro world facts are observed. Participants will receive a set of color Applied Failure Analysis reference books to take with them.

Skills/Topics taught:

Upon successful completion of this course, the participant will be able to:

- Use techniques and procedures to identify most probable root causes of failures
- Communicate with responsible parties and get corrective action to fix products and specific conditions that cause failures

Prerequisites: Recommendation of immediate supervisor, and/or service manager

Required equipment:

- Safety glasses with side shields, safety (or hard-toed) shoes are required.
- Appropriate work clothing is required.

Course Title . . . . . **Failure Analysis (Weld)**

Code: **TG05W**

Length: . . . . . **.3 Days**

Description: Applied Analysis (Welds) introduces the participant to basic metallurgy and failure analysis theory, as it would affect welding technicians. This course will consist of the following modules.

- Introduction to Failure Analysis
- Failure Analysis Management
- Basic Metallurgy
- Principles of Wear
- Principles of Fractures
- Visual Examination
- Threaded Fasteners
- Shafts
- Gears
- Welds
- Weld Symbols

Skills/Topics taught: After successfully completing this course, a welding technician will be able to do the following:

- Explain the value of good failure analysis.
- Describe key failure analysis principles and an 8-step failure analysis procedure.
- Explain how failure analysis principles can be applied in a daily work environment.
- Determine the similarities and differences between cast iron and steel, interpret steel classification codes and explain various material properties.
- Identify steps involved in various metalworking processes and explain the reasons for their use.
- Select appropriate combinations of materials, heating temperatures, times, quenching media and tempering temperatures to produce properly heat-treated parts.
- Identify which of several heat treatment production methods can produce high quality parts most cost-effectively.
- Recognize various materials and process problems associated with refining, shaping and forming and heat treatment.
- Classify common types of lads, stresses, stress raisers and load rates.
- Describe how overloads, stress raisers and low material strength reduce part life.
- Classify brittle, ductile and fatigue fractures.
- Locate fracture initiation sites.

(continued on next page)

Applied Failure Analysis (Welds) - continued

- Identify fractures caused by abnormal stress raisers, cyclic overloads, low material strength and other conditions.
- Recall and apply a 5-step procedure for recognizing and analyzing common wear types.
- Recognize surface features of an describe how surface material is removed by abrasive wear, adhesive wear, erosive wear, cavitations erosion, corrosive wear, fretting corrosion and contact stress fatigue.
- Determine wear locations and conditions and know were to look for more information.
- Explain the importance of performing a good visual analysis and properly sequence the steps of a visual examination procedure.
- Distinguish between background and other types of facts, list where to go to obtain background facts and record background facts.
- Obtain, identify and protect parts for visual examination.
- Apply correct inspection procedures for:
    - light source manipulation
    - inspection with the unaided eye
    - inspection with magnification
    - identifying and recording facts
- Clean parts to reveal all available facts without damaging surfaces.
- Recall and correctly sequence an 8-step procedure for analyzing failures.
- Explain the importance of defining problems and recognize good problem statements.
- Explain the importance of organized fact gathering and describe various ways to gather facts.
- Observe and record facts using visual examination procedures.
- Construct a possible root cause list.
- Determine the most probable root cause by using facts to eliminate possible causes.
- List appropriate courses of action that might be used to correct root causes.
- Explain the importance of proper follow up to ensure that problems are corrected.

Prerequisites: Recommendation of immediate supervisor, and/or service manager.

Required Equipment:

- Safety glasses with side shields, safety (or hard-toed) shoes are required.
- Appropriate work clothing is required.
- Weld fillet gauge

Course Title. . . . . Forklift Operator Training

Code TO15

Course Length. . . . . 1 Day

Description: This course is designed for the individual who has little to no experience operating a forklift and as a refresher for the more experienced operator.

Skills/Topics taught:

- Reasons for practicing job safety
- Rules for job safety
- Machine safety
- Pre-operation inspection
- Machine start up
- Operating techniques
    - Moving the machine
    - Balance points
    - Picking up a load
    - Traveling with a load
    - Loading trucks
    - Stacking material
- Machine parking and shut down

Prerequisites: A desire to learn the operation of forklifts.

Required equipment:

- Safety glasses and safety shoes.
- Clothing should be suitable for a classroom, operating and servicing forklifts, and being outside for extended periods of time.

Course Title . . . . Gas Engines ET (Electronic Technician)

**Code: . . . .

Course Title . . . . . Machine Operations for Service Technicians

Code: TO01

Length: . . . . . 1 Day

Description: This course is intended for the individual who needs to safely move a piece of equipment from point A to point B. This is not intended to make them an operator, it is a safety course.

This course may be of interest to:

- Service Technicians
- Mechanics
- Truck Drivers
- Yard People
- Equipment Welders
- Equipment Painters

The skills and techniques required of an equipment operator are not taught in this course.

Upon completion of this course the participants will be able to describe, and perform the following.

- Reasons for practicing job safety.
- Rules for job safety.
- Machine safety.
- The walk-around inspection.
- Inspection, before starting the engine.
- Operators compartment.
- Starting the engine.
- Moving the machine.
- Parking the machine.

Prerequisites:

- None

Required equipment:

- Safety glasses with side shields, safety (or hard-toed) shoes are required.
- Appropriate work clothing is required.

Course Title . . . . . Measuring Tools

Code: TG25

Length: . . . . . 1 Day

Description: Upon completion of this course, the participant will be able to take proper measurements and record the findings, add and subtract fractions and decimals.

Skills/Topics taught:

- Read a Ruler
- Read a Micrometer
- Read a Dial Indicator
- Record Findings

Prerequisites:

- None

Required equipment:

- Safety glasses with side shields, safety (or hard-toed) shoes are required.
- Appropriate work clothing is required.

Course Title ..... **Operator Safety Training**

Code **TS02**

Course Length ..... **1 Day**

Description: This course is intended for the individual who has previous experience operating heavy equipment but wishes to become familiar with the O.S.H.A. regulations (standards).

Skills/Topics taught:

Upon completion of this course; the participants will be able to describe, or perform, the following:

- Reasons for practicing job safety
- Rules for job safety
- Machine safety
- Become familiar with basic O.S.H.A. regulations
- The pre-operation inspection
- Safety practices for machine start up
- Safety practices for machine parking and shut down

Prerequisites:

- Basic heavy equipment operating skills

Required equipment:

- Safety glasses and safety shoes
- Clothing should suitable for a classroom, operating and servicing equipment, and being outside for extended periods of time.

Course Title . . . . . .SIS

Code TM58

Course Length . . . . . 1 Day

Description: This 8-hour course is an introduction to the Service Information System (SIS) provided by Caterpillar. All aspects of the program will be covered from introduction to final print out.

Skills/Topics taught:

After successful completion of this course, the student will be able to:

- Log on to S.I.S.
- Find the document or information using any route available within the system.
- Create a paper copy of the document or information located.

Prerequisites:

- None

Required equipment:

- Safety glasses with side shields, safety (or hard-toed) shoes are required.
- Appropriate work clothing is required.

Course Title . . . . . Technician Computer Training

Code TG02

Course Length . . . . . .1 Day

Description: This course is designed to teach technicians to use basic computer functions in a windows environment on the laptop or desktop personal computer. The course will enhance a technician's understanding of basic computer skills using exercises that participants will be expected to perform during this course.

Skills/Topics taught:

Upon completion of this course, the participant will:

- Be able to use basic windows functions
- Be able to cut, paste, copy and delete files
- Be able to build and organize a file directory to store information
- Understand how to open and save documents

Prerequisites:

- None

Required equipment:

- Participants are required to bring laptop to class.

NOTE: This course does not include CAT E.T. – see code TG61

Course Title . . . . . Electronic Technician (E.T.)

Code TG61

Course Length . . . . . .1 Day

Description: This course is designed to help technicians learn the abilities of E.T. and how to use it.

Skills/Topics taught:

Upon completion of this course, the participant will:

- View active and logged diagnostic codes
- View the status of a group of parameters
- View events where irregularities are logged by the ECM
- Graph a group of status parameters
- Perform diagnostic tests
- Perform calibrations
- Print reports and diagnostic test

Prerequisites:

- **Students should have their own laptop computers with E.T. loaded on them**

Required equipment:

- Safety glasses with side shields, safety shoes (or hard-toed)
- Appropriate work clothing is required.

NOTE: It is highly recommended that participants bring a laptop to class.

Course Title . . . . . **Hydraulic Systems**

Code **TM28**

Course Length . . . . . **.4 ½ Days**

Description: This course is designed to give knowledge and understanding of basic hydraulic principles, components, functions, graphical symbols and systems used on Caterpillar machine systems. The participant will acquire skills to identify, adjust, maintain and troubleshoot hydraulic systems during classroom and lab activities.

Skills/Topics taught:

Upon completion participants will be able to:

- Have an understanding of basic hydraulic principles
- Identify various hydraulic components
- Identify various hydraulic components using related symbols on schematics
- Explain the function of various hydraulic components.
- Explain differences and relationships of pressure and flow when troubleshooting speed and power complaints
- Have an understanding of hydraulic troubleshooting techniques
- Explain how engine performance affects hydraulic performance

Prerequisites:

- None

Required equipment:

- Safety glasses with side shields, safety (or hard-toed) shoes are required.
- Appropriate work clothing is required.

Course Title . . . . . **Hydraulic Systems Troubleshooting**

Code **TM53**

Course Length . . . . . **2 Days**

Description: This course will cover procedures for troubleshooting hydraulic systems on wheel type loader, track type loader and track type tractor implement hydraulic systems. Wheel loader steering systems will also be covered.

Skills/Topics taught:

Upon completion participants will be able to:

- Use 150 and orthographic schematics to trace hydraulic systems.
- Diagnose problems related to pumps, valves, filters, coolers, etc.
- Install testing tool groups.

Prerequisites:

- Hydraulic Systems (TM28)

Required equipment:

- Safety glasses with side shields, safety (or hard-toed) shoes are required.
- Appropriate work clothing is required.

Course Title . . . . . Advanced Motor Grader Operator Training

Code TO12

Course Length . . . . . 4 ½ Days

Description: This course is intended for the individual who has the basic skills of operating a Motor Grader and the basics of setting and reading grade.

Skills/Topics taught:

Upon completion of this course the student will be able to describe, or perform the following:

- Reasons for practicing job safety.
- Rules for job safety.
- Machine safety.
- The pre-operation inspection (review).
- Machine start up (review).
- Operating techniques will include:
    - Grading a road with a v-ditch
    - Building a crown
    - Grading on a slope
    - Grading in mud (discussion)
- Grades:
    - Slope ratio
    - Grades expressed in %
    - Reading off set stakes

Prerequisites:

The participants attending this course should have successively completed the Introduction to Motor Grader course or have an experience level in the operation of Motor Graders to pass the pre test with a proficiency rate of 80%.

Required equipment:

- Safety glasses with side shields, safety (or hard-toed) shoes are required.
- Appropriate work clothing is required.

Course Title . . . . . **Introduction to Motor Grader Operation**

Code **TO04**

Course Length . . . . . **5 Days**

Description: This course is intended for the individual who has little to no experience operating a Motor Grader. Throughout this course, the following information will be taught; and the individual will have learned the basics of Motor Grader operation.

The safety hazards associated with Motor Grader operations.
Becoming familiar with Motor Graders.
Basic Motor Grader operating techniques.

Upon completion of this course; thee participants will be able to describe, or perform, the following.

- The characteristics of a good operator
- Reasons for practicing job safety
- Rules for job safety
- Machine safety
- Basics of setting and reading grade
- The pre-operation inspection
- Machine start up
- Operating techniques, basic grading and ripping
- Machine parking and shut down

Prerequisites:

- A desire to learn the operation of heavy equipment

Required equipment:

- Safety glasses with side shields and safety (or hard-toed) shoes are required.
- Appropriate work clothing is required.

Course Title ..... **M Series Motor Graders**

Code **TM72**

Course Length .....**4 ½ Days**

Description: This course provides information on the system operation of the electrical system, operator's station, engine, power train, and all-wheel drive, implement, steering, fan and brake systems

Skills/Topics taught:

Upon completion of this course, the participants should be able to identify, describe, or perform the following:

- Electrical system
- Operators station
- Engine
- Power train
- All-wheel drive
- Implement system
- Fan system
- Brake system
- Explain the operation of the major components in the systems
- Trace the flow of oil through the systems

Prerequisites: Participants attending this course should have successfully completed:

- Electricity (TG01)
- PowerTrains (TM40)
- Diesel Engines (DE101)
- Caterpillar Electronic Unit Injector Engines (DE307)

Required equipment:

- Safety glasses with side shields, safety (or hard-toed) shoes are required.
- Appropriate work clothing is required.

Course Title . . . . . **Mobile Crane Operation**

Code **TO14**

Course Length . . . . . **1 Day**

Description:

This course is intended for the individual who has little to no experience operating a Mobile Crane and a refresher for the experienced operator.

Skills/Topics taught: Throughout this course the following information will be taught.

- Reasons for practicing job safety
- Rules for job safety
- Machine safety
- Basic rigging and hand signals
- Inspection of the area and the operation for hazards
- Mobile Crane pre-operation inspection
- Instruments and controls
- Machine start up
- Reading the load chart
- Machine operation
- Machine parking and shut down

Prerequisites: The desire to learn the operation of a Mobile Crane.

Required equipment:

- Safety glasses and safety shoes (Required)
- Clothing should be suitable for a classroom, operating and servicing equipment, and being outside for extended periods of time.

Course Title . . . . . .Small Off-Highway Trucks

Code TM18

Course Length . . . . . 5 Days

Description: This course is designed for service technicians to gain system knowledge and understanding on Caterpillar small off highway trucks (770, 773, 775, 777) to enhance troubleshooting skills. These systems include engine, power train, hydraulic and electrical systems. This course concentrates on how these systems operate by utilizing classroom instruction and hands on lab activities.

Skills/Topics taught:

- Location and function of engine components
- Location and function of power train components
- Proper selection of tooling and test procedures for power train components
- Location and function of hydraulic system components
- Proper selection of tooling and test procedures for hydraulic system components
- Function of electrical system components and schematics

Prerequisites:

- Hydraulic Systems (TM28)
- Power Trains (TM40)

Required equipment:

- Safety glasses with side shields, safety (or hard-toed) shoes are required.
- Appropriate work clothing is required.

Course Title . . . . . **On-Highway Truck Transmission**

Code **TM84**

Course Length . . . . . **2 Days**

Description: This course covers the CX28 / CX31 / CX35 On-Highway Truck Transmissions Caterpillar product line.

Skills/Topics taught:

- Find information in the operator and maintenance guide
- Locate and identify the major components of the transmission
- Explain the operation for each component in the transmission
- Trace the flow of oil through the transmission controls and transmission clutches
- Test, adjust the transmission pressures and troubleshoot the transmission hydraulic system
- Follow electrical schematics in the service manuals
- Hook up test instruments to the transmission electrical system and troubleshoot the system

Prerequisites:

- None

Required equipment:

- Safety glasses with side shields, safety (or hard-toed) shoes.
- Appropriate work clothing is required.

Course Title . . . . . On-Highway Truck Air Conditioning

Code TG12B

Course Length . . . . . .4 ½ Days

Description: This course is designed to prepare the participant with E.P.A. requirements and service procedures while remaining legal and diminishing the venting of refrigerants into the environment. There is much legality involved with air conditioning service work today. The shop and/or field technician is exposed to new challenges every day that can affect his job and his company's liability. This course will help bring service technicians up to date on the new and changing air conditioning service procedures, and make the service person feel more comfortable with legal requirements that face him. He will learn and understand EPA and state mandates that help the company's bottom line. This course will host a Lab containing the new CT660 and 680 vehicles for hands on training. The electrical systems associated with the HVAC System will also be understood by your yard technicians.

Skills/Topics Taught:

This course will concentrate on:

- The basics of A/C circuit system components
- The nomenclatures involved
- MSDS familiarity
- System operation and testing
- The latest service options
- Compliance with environmental issues
- HVAC Electrical system schematic reading
- HVAC Electrical system operation
- HVAC Electrical System hands on troubleshooting LAB
- Test procedures and test equipment will be introduced and used
- Refrigerant recovery, recycling, reclamation
- Disposal of used refrigerant oils
- "SNAP" alternative refrigerants
- Refrigerant identification
- Refrigerant remediation
- OSHA, DOT, and EPA rules concerning A/C
- The use of manifold gauges, their proper connection/disconnection with the system
- Effective diagnoses and troubleshooting
- Who is affected by the fines that the EPA can impose
- Determining which part is defective as a means of cost control for the customer and for our companies

A portion of the legal requirements for air-conditioning service work is an EPA sanctioned certification test. A certification text will be administered to technicians attending this course.

Prerequisites: None

Required Equipment:

- Safety glasses with side shields, and safety (hard toed) shoes are required
- Appropriate work clothing is required

Course Title . . . . . On-Highway Truck Electronics Troubleshooting

Code DE205B

Course Length . . . . . 4 ½ Days

Description: This course is designed to provide the knowledge and skills required to perform electronic engine programming, diagnostics, and electrical repairs.

A strong emphasis will be placed on the development of the skills necessary to perform special routine diagnostic and calibration procedures. Participants will be expected to perform key tasks during classroom and lab sessions as presented in the course.

Skills/Topics taught: Upon completion of this class, participants should be able to:

- Recognize electronic engine components and understand their functions
- Use diagnostic tooling including the digital multimeter
- Calibrate and adjust electronic engine components
- Test electronic components
- Troubleshoot electronic systems
- Use Caterpillar ET and STW to acquire needed information and perform work
- Flash an engine electronic module (ECM)
- Copy/change customer parameters
- Download and program Injector Trim-files into ECM
- Successfully troubleshoot Caterpillar electronic engines

Prerequisites:

- Electricity (TG01 – highly recommended, not required)

Required equipment:

- Safety glasses with side shields and safety (or hard-toed) shoes are required
- Appropriate work clothing is required

Course Title . . . . . On-Highway Truck ABS Service

Code . . .. ABS

Course Length . . . . . 3 Days

Description: This course is designed to provide the knowledge and skills required to perform ABS brake diagnostics and service repairs for On-Highway Trucks.

A strong emphasis will be placed on the development of the skills necessary to perform special and routine diagnostic and repair procedures. Participants will be expected to perform key tasks during classroom and lab sessions presented in the course. The lab will utilize a CT660 and CT680 for practical troubleshooting scenarios.

Skills/Topics taught: Upon completion of this class, participants will be able to:

- Recognize various ABS components and understand their functions
- Use diagnostic tooling including the digital multimeter
- Test ABS electronic components
- Troubleshoot ABS electronic systems (Wabco, Bendix, and Meritor)
- Use software to acquire needed information to perform successful repairs
- Successfully troubleshoot the CT660 ABS System

Prerequisites:

- Electricity CT660 and CT680 – Cab Chassis Electrical #42542 **(Required)**
- Electricity (TG01 – highly recommended, not required)

Required equipment:

- Safety glasses with side shields and safety (or hard-toed) shoes are required
- Appropriate work clothing is required.

Course Title . . . . . .On-Highway Truck Foundation Brakes
Code . . . . . FBS
Course Length . . . . . 4 ½ Days

Description: This course is designed to provide the knowledge and skills required to perform foundation brake diagnostics and service repairs for On-Highway Trucks.

A routine emphasis will be placed on the development of the skills necessary to perform special and routine diagnostic and repair procedures. Participants will be expected to perform key tasks during classroom and lab sessions as presented in the course.

Skills/Topics taught: Upon completion of this class, participants will be able to:

- Recognize various foundation brake components and understand their functions
- Use diagnostic tooling including the micrometer and dial indicators
- Test ABS electronic components
- Troubleshoot ABS electronic systems (Wabco, Bendix, and Meritor)
- Use software to acquire needed information to perform successful repairs
- Successfully troubleshoot the CT660 ABS System

Prerequisites:

- Electricity (TG-1 – highly recommended, not required)

Required Equipment:

- Safety glasses with side shields and safety (or hard-toed) shoes required
- Appropriate work clothing is required

Course Title . . . . . On-Highway Truck Electricity
Code . . . . . TG01 (P) 1
Course Length . . . . . 4 Days

Description: This course is designed for service technicians to gain system knowledge and understanding on Peterbilt electrical systems to enhance troubleshooting skills. These systems include the Lighting System, Starting System, and Charging System. This course concentrates on the fundamentals of electricity and how electrical systems are used on Caterpillar On-Highway Trucks by utilizing classroom instruction and hands on lab activities. Lab will consist of Peterbilt 387 troubleshooting scenarios which will enhance the technicians understanding of troubleshooting these electrical systems.

Skills/Topics taught:

- Understanding of Voltage, Amperage, Resistance relationship
- Proper selection and use of Voltmeter, Ammeter, Ohmmeter
- Interpretation of Peterbilt Schematics
- Proper testing and maintenance of batteries
- Proper disassembly, assembly and maintenance of connectors
- Understanding and troubleshooting of the Lighting system
- Understanding and troubleshooting of the Starting System
- Understanding and troubleshooting of the Charging System

Prerequisites:

- None

Required Equipment:

- Safety glasses with side shields and safety (or hard-toed) shoes required
- Appropriate work clothing is required

Course Title . . . . . CT660 Cab/Chassis Electrical
Code 42542

Course Length . . . . . 4 ½ Days

Description: This course is designed for service technicians to gain system knowledge and understanding on Caterpillar electrical systems to enhance troubleshooting skills. These systems include the Lighting System, Starting System, and Charging System. This course concentrates on the fundamentals of electricity and how electrical systems are used on Caterpillar On-Highway Trucks by utilizing classroom instruction and hands on lab activities.

Lab will consist of CT660 and CT680 troubleshooting scenarios which will enhance the technicians understanding of troubleshooting these electrical systems.

Skills/Topics taught:

- Understanding of Voltage, Amperage, Resistance relationship
- Proper selection and use of Voltmeter, Ammeter, Ohmmeter
- Interpretation of Caterpillar Corporate Schematics
- Proper testing and maintenance of batteries
- Proper disassembly, assembly and maintenance connectors
- Understanding and troubleshooting of the Lighting System
- Understanding and troubleshooting of the Starting System
- Understanding and troubleshooting of the Charging System

Prerequisites:

- None

Required Equipment:

- Safety glasses with side shields and safety (or hard-toed) shoes required
- Appropriate work clothing is required

Course Title . . . . . **Asphalt Pavers**
Code **AP02**

Course Length . . . . . **2 Days**

Description:

Classroom work will include discussion of schematics and components of the hydraulic and electrical systems, product performance and improvements.

Skills/Topics taught:

Participants should be able to:

- Identify all major machine components
- Explain the operation of the hydraulic system
- Trace the flow on both electrical and hydraulic schematics

Prerequisites: Participants attending this course should have successfully completed:

- Hydraulic Systems (TM28)

Required equipment:

- Safety glasses with side shields, safety (or hard-toed) shoes
- Appropriate work clothing is required.

Course Title . . . . . .Compactors

Code TM22

Course Length . . . . . 3 Days

Description:

Classroom work will include discussion of schematics and components of the hydraulic and electrical systems, compaction basics, product performance, and improvements.

Skills/Topics taught:

Participants should be able to:

- Trace oil flow on the schematics
- Describe the function of all major machine components
- Perform basic testing, adjusting and troubleshooting
- Explain the basic machine operation and application

Prerequisites: Participants attending this course should have successfully completed:

- Hydraulic Systems (TM28)

Required equipment:

- Safety glasses with side shields, safety (or hard-toed) shoes
- Appropriate work clothing is required.

Course Title . . . . . **CS 500 Compactors**

Code **TP01**

Course Length . . . . . **3 Days**

Description: This presentation describes the operation of the steer/charge pump and pump oil distribution, steer, propel and vibratory systems of Vibratory Compactors.

Skills/Topics taught:

After learning the information in this presentation, the technician will be able to:

- Locate and identify the major components in the steer/charge pump, propel system and vibratory system
- Explain the operation of each system
- Trace oil through the hydraulic system

Prerequisites: Participants attending this course should have successfully completed:

- Hydraulic Systems (TM28)
- Electricity (TG01)

Required equipment:

- Safety glasses with side shields, safety (or hard-toed) shoes
- Appropriate work clothing is required.

Course Title . . . . . .RM300-500 Rotary Mixer

Code TM70

Course Length . . . . . 4 Days

Description: This course is designed to describe the operation of the hydraulic and electrical systems, and components,.

Skills/Topics taught: Upon completion of this class, participants should be able to:

- Locate and identify major components on the machine
- Explain the function of and properly use all machine controls
- Explain operation of the machine's hydraulic systems by tracing oil flow through each of the systems.
- Explain operation of the machine's electrical system by tracing current flow through the system.

Prerequisites:

- Hydraulic Systems (TM28)
- Electricity (TG01)

Required equipment:

- Safety glasses with side shields, safety (or hard-toed) shoes
- Appropriate work clothing is required.

Course Title . . . . . Caterpillar Electric Power I (CEP I)

Code 33202

Course Length . . . . . 4.5 Days

Description: This course is designed to prepare the electrical power generation technician with the knowledge and skills necessary to understand the theory and principles of electricity and power generation. This course also meets the prerequisite course requirements necessary for enrollment in the Caterpillar Electric Power Basic.

Learning Objectives: After completion, the participant will understand and be able to do:

- Safety: General – personal and equipment safety.
- Electrical – equipment and electrical circuit safety.
- Basic Electricity: Electrical fundamentals, magnetism, induction, basic electric circuits, introduction to electrical diagrams.
- Diagnostic Tooling: Volts Ohm meter, ammeter, phase rotation meter and Meg Ohm meter.
- Basic Power Generation: Single phase A/C, Three Phase A/C, Generator components and connections, Regulator components and Introduction to power factor.
- Insulation Resistance: Theory, testing and preventive maintenance.

Prerequisites:

- None

Required equipment:

- Safety glasses with side shields, safety Electrical Hazard rated shoes are required.
- NFPA 2112 FR Rated Clothes

Course Title . . . . . Caterpillar Electric Power II (CEP II)

Code 26240

Length . . . . . 4.5 Days

Description: This course provides an in-depth study and hands-on activity in delivering, maintaining, troubleshooting and repairing current and legacy production Caterpillar Generator Sets operating as single units. The participants will successfully perform key tasks selected from topics presented in the course. After completion, the participant will be able to: Properly recognize generator actual and apparent power loading. State the effects of power factor and reactive/resistive loading on the engine and generator. Recognize different circuit breaker types. Test, adjust, and troubleshoot current production and legacy generator sets, generator mounted control panels, engine-mounted junction boxes, including electromechanical control panels, Electronic Modular Control Panel II+, EMCP3, and EMCP 4. Perform the proper voltage and frequency adjustments per customer requirements for VR3, VR6, DVR, CDVR and IVR voltage regulators. Perform proper planned maintenance and make diagnostic measurements on generators.

Learning Objectives: Participants will be able to:

- Identify, discuss and navigate the Caterpillar online information resources.
- Discuss generator fundamentals including construction, generation theory, generator operational limits, and restrapping.
- Perform procedures for maintenance and diagnostic testing with proper specifications and proper tooling. Properly recognize generator actual and apparent power loading.
- Understand the effects of power factor and reactive loading on the engine and generator.
- Identify and diagnose electrical common electrical components on voltage regulators, control panels, and control systems.
- Specify, test, and adjust voltage regulators per customer requirements.
- Properly utilize electrical drawings for system troubleshooting and safety.
- Discuss EMCP II+, EMCP 3, and EMCP 4 I/O and programming.
- Discuss controls strategies for generators with EUI and MUI engines.
- Identify circuit breakers and other single unit protective devices.
- Explain the differences between integral and remote circuit breaker trip functions. Identify Cat ATS models. Overview ATS control strategies.

(Continued on next page)

Prerequisites: Participants attending this course should have successfully completed:

- CAT Electric Power I – Online course 1-7
- CAT Electronic Communications
- ELE C02 – Electrical Schematics

Required equipment:

- Safety glasses with side shields, safety Electrical Hazard rated shoes
- NFRA 2112 FR rated clothing
- Laptop computer with Caterpillar CDVR PC software

Course Title . . . . . Caterpillar Electric Power III (CEP III)

Code: 26236

Length . . . . . 4.5 Days

Description: This course provides an in-depth study and hands-on activity in delivering, maintaining, troubleshooting, and repairing current and legacy production Caterpillar Generator Sets operating in parallel. Caterpillar legacy switchgear and transfer switches are also covered. The participants will successfully perform key tasks selected from topics presented in the course including parallel operation and necessary adjustments. Special Instructions: Participants are asked to bring a calculator to class. Also required are safety glasses, minimum 600 Volt rated gloves, and natural fiber clothing (cotton). Helmet with shield and outerwear are provided. Leather shoes are required. EH (electrical hazard) rated shoes are recommended.

Learning Objectives: Participants will be able to**:**

- Understand the effects of loading on the engine and generator.
- Adjust voltage regulators to share generator reactive (KVAR) loads. Close circuit breakers to parallel generators after making proper engine and generator adjustments. This also requires proper synchronization and phase rotation verifications.
- Divide engine load (KW) by making the proper governor adjustments.
- Adjust for minimum circulating current.
- Connect and adjust generators to operate in parallel using voltage droop and cross current compensation.
- Perform initial settings, testing, adjusting, and troubleshooting on Woodward 1724 and 2301A governors (both load sharing and speed control) as well as Digital Voltage Regulators, floor standing switchgear, and transfer switches.
- Perform proper planned maintenance on generators.
- Recognize the principles of cogeneration and peak shaving.
- Recognize switchgear components, functions, and required wiring.
- Recognize CTS & CTG transfer switches, diagrams, features and programming.
- Understand remote and direct interface with Generator Set Control Panels, annunciators, and engine ECM’s using PL1000 and CCM.

(Continued on next page)

Prerequisites: Participants attending this course should have successfully completed:

- CEP II (26240)

Required equipment:

- Safety glasses with side shields, safety Electrical Hazard rated shoes
- FR clothing required
- Laptop Computer

Course Title . . . . . Caterpillar Electric Power Compact Generator Sets

Code: 33210

Length . . . . . 4.5 Days

Description: This is an Intermediate level course on Caterpillar Compact / Olympian Generator Sets and related products. This course will prepare the participating Electric Power Generator Technician to set up, adjust, troubleshoot and maintain Cat Compact / Olympian generators, engines and control panels product. Students will learn to read Cat Compact / Olympian schematics and the functions of 2001, 4001, 4001E, Access 4000 controls, EMCP3, EIM and EIM+ modules and Remote Annunciators. Students will develop skills in testing and adjusting: Cat Compact / Olympian Generators, voltage regulators, gas trains and electronic governors. The course will include classroom presentation/discussion and supervised specific hands on skill development. Students attending this class should have 2 years' experience with gensets, 2 years' experience with engines and the ability to adjust hydra-mechanical governors. Additionally, the student should have at least one year on the job AC electrical experience and have completed EMCP3 training. They should be able to: correctly wire a generator to a motor to make it rotate in the proper direction; properly use a multi-meter and read electrical wiring diagrams. They should have basic algebra and computer skills. Note: Students must have completed employers Electrical Safety training within the previous 12 months.

Learning Objectives: Participants will be able to:

- Evaluate Cat Compact / Olympian Generator Sets (OGS) for proper set-up
- Troubleshoot Cat Compact / OGS and accurately identify faulty system and/or components
- Perform Service and Maintenance of the Cat Compact / OGS products
- Complete repairs and return Cat Compact / OGS to proper operational service

(Continued on next page)

Prerequisites: Participants attending this course should have successfully completed:

- Gas Engine Fundamentals
- Basics of Electricity for Electric Power
- RDLC – CAT Electric Power I
- Engine Fundamentals
- Generator Set Ratings
- Service Campus – Fundamentals – Electrical

Required equipment:

- Safety glasses with side shields, safety Electrical Hazard rated shoes
- FR clothing required.
- Laptop Computer

Course Title . . . . . **Caterpillar Electric Power Marketing Class**

Code **TEM01**

Length . . . . . **4.5 Days**

Description: This course is designed to provide an overview of EPG products and systems. A strong emphasis will be placed on the development of an understanding of the requirements necessary to install, operate and maintain EPG systems products. Participants will be expected to perform key tasks during classroom and lab sessions as presented in the course.

Skills/Topics taught:

- Understand generator fundamentals
- Understand maintenance and service tooling
- Understand loading and response
- Understand voltage regulators
- Understand control panels
- Understand automatic transfer switches
- Understand EPG sizing and ventilation requirements
- Understand UPS requirements
- Understand AES requirements

Prerequisites:

- None

Required/Suggested equipment:

- Safety glasses with side shields and safety shoes
- Work clothing suggested
- Laptop Computer

Course Title ..... **Caterpillar Electric Power Modules**

Code **20849**

Length ..... **3 Days**

Description: This course provides an in-depth study and hands on activity in application, startup, operation, and troubleshooting of Caterpillar Power Modules. Students will be provided instruction in engine and generator performance, switchgear, and Paralleling Applications. The participant should have a minimum of 3 years' experience in generator set applications. Students must bring electrical safety gloves rated at 1000vac (or higher) and are asked to wear electrical arc flash rated or cotton cloths. Suitable clothes should be worn for weather conditions according to the seasons. The Power Module will be located outside while simulators will be located in the classroom.

Learning Objectives: Participants will be able to**:**

- Use the touch screen to setup the Power Module for single generator operation
- Use the touch screen to setup the Power Module for parallel generator operation
- Understand the application of Power Modules for standby, prime/continuous power, and parallel operation with other legacy and current generators.
- Use and understand switchgear wiring diagrams and schematics to troubleshoot current production Power Module Switchgear.
- Gain an understanding of the PLC's used in current Power Modules.
- Interconnect current and legacy switchgear for parallel operation.
- Understand the procedure of how to change from 60Hz to 50Hz operation.
- Have knowledge to operate the Power Module in single generator operation without the switchgear.

Prerequisites:

- None

Required equipment:

- Safety glasses with side shields, safety Electrical Hazard rated shoes, class 0 electrical gloves and protectors
- FR work clothes
- Laptop computer

Note: The participant should have a minimum of 3 years' experience in generator set applications.

**Course Title . . .

Course Title . . . . . Electric Power Systems Diagnostics II

Code 44344

Course Length . . . . . 5 Days

Description: This course is designed for service technicians to gain system knowledge of diagnostic testing methods on electric power generating systems to enhance troubleshooting skills. The course builds on the advanced tooling and testing of electrical systems. Participants will use test equipment for generator diagnostics and floor standing switchgear for prime power diagnostics. Class emphasis is placed on lab activities where participants will be expected to perform key testing tasks. A minimum score of 80% on the final practical exam is required to pass this course.

Skills/Topics taught:

After completion, the participant will be able to:

- Perform Electrical Power Systems Data collection
- Perform Electrical Power Systems Analysis tests
- Perform Basic Relay testing and Meter calibration
- Perform Low Voltage Circuit Breaker inspection and maintenance
- Perform Medium Voltage Circuit Breaker inspection and maintenance
- Perform Low and Medium Voltage Cable inspection and testing

Prerequisites:

- Minimum of four years' required experience as a generator technician **(Required)**
- Completion of EPSD I **(Required)**
- CAT Electric Power I
- CAT Electric Power II (Recommended)

Required equipment:

- Safety glasses with side shields, safety (or hard toed) shoes, class 0 electrical gloves and protectors
- Laptop computer
- FR work clothing

Course Title . . . . . Electric Power Systems for Machine Technicians

Code . . . . . EPSM - 1

Course Length . . . . . 4.5 Days

Description: This course is designed for Machine Service Technicians to gain system knowledge of diagnostic testing methods on electric power generating systems to enhance troubleshooting skills. This course concentrates on the tooling and testing of machine electrical power systems. Participants will use test equipment and testing procedures for power system diagnostics. Class emphasis is placed on lab activities where participants will be expected to perform key testing tasks. A minimum score of 80% on the final practical exam is required to pass this course. If a passing grade is not achieved, the attendee has the option of re-registering in future training – no provision exists for "re-testing".

Skills/Topics taught:

After completion, the participant will be able to:

- Understand generator fundamentals
- Understand alternator fundamentals
- Proper selection of safety PPE and tooling
- Proper selection and use of electrical diagnostic tools and testing equipment
- Proper interpretation of the test results

Prerequisites: It is recommended that participants complete one of the following:

- Electricity (TG01)
- Electronic Troubleshooting I (26679)

Required Equipment:

- Safety glasses with side shields, safety (or hard toed) shoes
- FR work clothing

Course Title . . . . . EMCP 4.1 – 4.2 Controls

Code 40002

Course Length . . . . . 3 Days

Description: The EMCP 4.1 / 4.2 Control, provides an in-depth study and hands on activities for installation, start-up, and maintenance of the EMCP 4.1 and EMCP 4.2 control. The class will also focus on the application and programming of the EMCP 4.1 and EMCP 4.2 and peripheral modules.

Skills/Topics taught: After completion, the participant will be able to:

- Perform input and output programming utilizing ET and the front panel of the EMCP 4.
- Setup the parameters in the EMCP 4 to match the generator. · Identify the capabilities and functionality of the EMCP 4.1 and EMCP 4.2.
- Perform peripheral module programming associated with the EMCP4. These modules may include the Annunciator, Discrete I/O module, Thermocouple Module, and RTD Module.
- Exhibit an understanding of the different communication protocols on the EMCP4.

Prerequisites: It is recommended that participants complete the following:

- CEP I (33302)
- CEP II (26240)

Required equipment:

- Safety glasses with side shields, safety electrical hazard shoes
- FR clothing required
- Laptop Computer

Course Title . . . . . Holt Cat Electrical Safety – EPG (NFPA 70E)

Code HC101

Course Length . . . . . 1 Day

Description: This course is for HOLT CAT employees only. This course is designed for Electric Power Generation (EPG) technicians. The course is designed to provide hands-on training and skills to augment the PureSafety web-based safety training to ensure compliance with OSHA 1910 Sub Part S.

Skills/Topics taught: After completion, the participant will be able to:

- Determine what Personal Protective Equipment (PPE) is required.
- Determine how to wear, maintain, and use proper PPE.

Prerequisites: It is required that participants complete the following:

- PureSafety NFPA 70E online training

Required equipment:

- Electrical Hazard (EH) rated footwear
- FR clothing required

Course Title . . . . . Holt Cat Electrical Safety – Machine (NFPA 70E)

Code HC102

Course Length . . . . . 1 Day

Description: This course is for HOLT CAT employees only. This course is designed for Machine technicians. The course is designed to provide hands-on training and skills to augment the PureSafety web-based safety training to ensure compliance with OSHA 1910 Sub Part S.

Skills/Topics taught: After completion, the participant will be able to:

- Determine what Personal Protective Equipment (PPE) is required.
- Determine how to wear, maintain, and use proper PPE.

Prerequisites: It is required that participants complete the following:

- PureSafety NFPA 70E online training

Required equipment:

- Arc Flash Personal Protective Equipment (PPE)
- Electrical Personal Protective Equipment
- Electrical Hazard (EH) rated footwear
- FR clothing required

Course Title . . . . . Olympian LTA and LG Model Gas Gensets

Code: 33450

Length: . . . . . 4.5 Days

Description: This is an Intermediate level pilot course on Olympian LTA and LG model gas generator sets. This pilot course will prepare the participating Electric Power Generator Technician to set up, adjust, troubleshoot and maintain Olympian LTA and LG model gas generator sets and the H-100 control panel product and Genlink DCP fundamentals. Students will learn to read and utilize Olympian LTA and LG series schematics and drawings and the functions of remote annunciators and remote relay panels. Students will develop skills in testing and adjusting Olympian LTA and LG model generators, gas trains and associated equipment. The pilot course will include classroom presentation/discussion and supervised specific hands on skill development. Students attending this class should have 1 year experience with gensets, 1 year experience with engines and have at least one year on the job AC electrical experience. They should be able to: correctly wire a generator to a motor to make it rotate in the proper direction, properlyuse a multi-meter and read electrical schematics and wiring diagrams. They should have basic algebra and computer skills.

Skills/Topics taught: Participants will be able to**:**

- Evaluate Olympian LTA and LG model Generator Sets (O.G.S.) for proper installation and start-up inspection completing required forms.
- Troubleshoot O.G.S. and accurately identify faulty system and/or components.
- Perform Service and Maintenance of Olympian LTA and LG model Generator Sets.
- Complete repairs and return O.G.S. to proper operational service

Prerequisites:

- Generator Set Ratings
- Gas Engine Fundamentals
- Basics of Electricity for Electric Power
- Engine Fundamentals

Required equipment:

- Safety glasses with side shields, safety Electrical Hazard rated shoes, FR work clothing
- Laptop Computer
- Key Lock – part # 10000-42222
- RS 232 Cable – part # 10000-42223

Course Title . . . . . Automatic Transfer Switches (ATS)

Code: 33725

Length: . . . . . 4.5 Days

Description: This course will provide a basic overview of ATS components and operations. The student will perform basic ATS programming, preventive maintenance, and troubleshooting

Learning Objectives: Students will learn:

- Basic Automatic Transfer Switch (ATS) functions, device options, and operations, including the following:
  - MX 150
  - MX250
  - MX350
  - ATC300
  - ATC800
  - Bypass switches
  - Close-transition switches
  - Breaker switches

Prerequisites:

- None

Course Title . . . . . Generator Set Preventative Maintenance

Code: TE90

Length: . . . . . 4.5 Days

Description: This course is designed to provide the knowledge and skills to perform preventative maintenance on generator sets used in prime and standby applications. A strong emphasis will be placed on the development of the basic skills necessary to perform special and routine maintenance procedures. Participants will be expected to perform key tasks during classroom and lab sessions as presented in the course.

Skills/Topics taught: Upon completion of this class, participants should be able to:

- Have an understanding of major generator components
- Perform a visual inspection of generator and identify problems
- Explain and identify potential safety problems in generator maintenance
- Explain and perform preventative maintenance procedures on:
    - Cooling system
    - Fuel system
    - Air induction and exhaust system
    - Lubrication system
    - Starting and charging system
    - Engine control, monitoring and safety system
    - Generator Alternator
- Perform inspection and operational checks on automatic transfer switch
- Explain the need for insulation testing
- Explain the need for proper load bank testing

Prerequisites: It is recommended that participants complete the following:

- CEP I (33302)

Required equipment:

- Safety glasses with side shields, safety Electrical Hazard rated shoes
- FR work clothing

Course Title . . . . . Compact Construction Equipment

Code TM57

Course Length . . . . . 4 Days

Description: This course identifies the components and describes the operation of the power train hydraulic system, brake hydraulic system, steering hydraulic system, implement hydraulic system and the hydrostatic drive electronic control system on the Skid Steer, 902 and 906 Compact Wheel Loaders. It also introduces the Mini-Hydraulic Excavators and discusses the basic design characteristics and machine systems including component location and function. Hydraulic systems operation and maintenance points are also covered.

Skills/Topics taught:

Upon completion of this course participants will be able to:

- Locate and identify the major components in the operator's station, power train, machine hydraulic systems, undercarriage and engine.
- Check fluid levels in the engine, power train and machine hydraulic systems.
- Trace oil flow through the hydrostatic drive and implement hydraulic systems.
- Explain the operation of each system.
- Explain the function of the major components in the operator's station, undercarriage, engine and hydraulic system.
- Locate and identify the maintenance locations and test points.

Prerequisites:

- Hydraulic Systems (TM28)

Required equipment:

- Safety glasses with side shields, safety (or hard-toed) shoes
- Appropriate work clothing is required.

Course Title . . . . . Skid Steer Loaders/Multi-Terrain

Code TM69

Course Length . . . . . 3 Days

Description: This course is designed for the service technician. The course will cover and identify the components and describe the operation of the electronically controlled pilot system, power train hydraulic system and the implement hydraulic system on the Skid Steer Loader.

Skills/Topics taught:

Upon completion of this course, the service technician will be able to locate and identify the major parts of the:

- Operator station
- Engine compartment
- Pilot hydraulic system
- Drivetrain
- Implement system
- Maintenance locations and test points
- Trace oil flow through the hydrostatic drive and implement systems
- Perform system test on the hydrostatic drive and implement systems

Prerequisites: Participants attending this course should have successfully completed:

- Electricity (TG01)
- Hydraulic Systems (TM28)

Required equipment:

- Safety glasses with side shields, safety (or hard-toed) shoes
- Appropriate work clothing is required.

Course Title . . . . . Air Conditioning

Code TG12

Course Length . . . . . 4.5 Days

Description: This course is designed to prepare the participant with E.P.A. requirements and service procedures while remaining legal and diminishing the venting of refrigerants into the environment. There is much legality involved with air conditioning service work today. The shop and/ or field technician is exposed to new challenges every day that can affect his job and his company's liability. This course will help bring service technicians up to date on the new and changing air conditioning service procedures, and make the service person feel more comfortable with the legal requirements that face him. He will learn and understand EPA and state mandates that help protect the company's bottom line.

Skills/Topics taught:

This course will concentrate on:

- The basics of A/C circuit system components
- The nomenclatures involved
- MSDS familiarity
- System operation and testing
- The latest service options
- Compliance with environmental issues
- Test procedures and test equipment will be introduced and used
- Refrigerant recovery, recycling, reclamation
- Disposal of used refrigerant oils
- "SNAP" alternative refrigerants
- Refrigerant identification
- Refrigerant remediation
- OSHA, DOT and EPA rules concerning A/C
- The use of manifold gauges, their proper connection/disconnection with the system
- Effective diagnosis and troubleshooting
- Who is affected by the fines that the EPA can impose
- Determining which part is defective as a means of cost control for the customer and for our companies.

A portion of the legal requirements for air-conditioning service work is an EPA sanctioned certification test. A certification test will be administered to technicians attending this course.

Prerequisites: None

Required equipment:

- Safety glasses with side shields, and safety (or hard-toed) shoes are required.
- Appropriate work clothing is required.

Course Title . . . . . **Telehandler Operator Training**

Code **TO16**

Course Length . . . . . **1 Day**

Description: This course is designed for the individual who has little to no experience operating a Telehandler and as a refresher for the more experienced operator.

Skills/Topics taught:

- Reasons for practicing job safety
- Rules for job safety
- Machine safety
- Pre-operation inspection
- Instruments and controls
- Machine start up
- Operating techniques
    - Moving the machine
    - Balance points
    - Machine setup
    - Reading load charts
    - Picking up a load
    - Traveling with a load
    - Loading/Unloading trucks
    - Stacking material
- Machine parking and shut down

Prerequisites:

- A desire to learn the operation of Telehandlers

Required equipment:

- Safety glasses, safety shoes
- Clothing should be suitable for a classroom, operating and servicing Telehandlers and being outside for extended periods of time.

Course Title . . . . . Telehandlers

Code TM65

Course Length . . . . . 3 Days

Description: This course pertains to TL and TH Telehandlers. This will be taught both in the classroom and on the iron. Material will cover engine, transmission, hydraulic, steering, and brake systems, operations, testing and adjusting.

Skills/Topics taught:

Participants should be able to:

- Explain the machine systems
- Test and adjust the engine fuel system, transmission, brakes, electrical, and hydraulic
- systems

Prerequisites:

- Hydraulic Systems (TM28)

Required equipment:

- Safety glasses with side shields, safety (or hard-toed) shoes
- Appropriate work clothing is required.

Course Title . . . . . Advanced Dozer Operator Training

Code TO09

Course Length . . . . . 4 ½ Days

Description: This course is intended for the individual who has the basic skills of operating a Dozer and the basics of setting and reading grade.

Skills/Topics taught: Participants should be able to understand:

- Reasons for practicing job safety
- Rules for job safety
- Machine safety
- Setting and reading trench grades, slope ratio, and rising and falling grades
  - expressed in percentages
- The pre-operation inspection (review)
- Machine start up (review)
- Operating Techniques:
  - Cutting and backfilling to grade
  - Cutting and building slopes
  - Ditching
  - Various ripping techniques
  - Discussion on working in unstable soil
- Machine parking and engine shut down (review)

Prerequisite:

- The student should have successively completed the Introduction to Dozer Operation course, or have an experience level in the operation of Dozers to pass the pre test with a proficiency rate of 80%.

Required equipment:

- Safety glasses with side shields, safety (or hard-toed) shoes
- Appropriate work clothing is required.

Course Title . . . . . **D7E Track Type Tractor**

Code **TM82**

Course Length . . . . . **4 Days**

Description: This course is designed to provide technicians with specific information relating to the systems on the D7E Track Type Tractors. This course covers component identification, function, system operation, and testing and adjusting.

Skills/Topics taught: Participants should be able to understand:

- Machine and High Voltage Electrical Safety
- High Voltage Cabling
- Understand the Undercarriage
- Describe the Operator Station
- Use the Monitor System
- Use ET to monitor systems
- Understand emissions systems
- Understand implement system
- Test and adjust engine and support systems
- Understand and monitor the Electric Drive Power Train
- Understand and monitor the Differential Steering, Brakes, and Final Drives

Prerequisites:

- Electric Power Systems for Machine Technicians – EPSM -1

Required equipment:

- Safety glasses with side shields
- Arc Flash Personal Protective Equipment (PPE)
- Electrical Personal Protective Equipment
- Electrical Hazard (EH) rated footwear
- 100% Cotton Clothes

Course Title . . . . . .**Track Type Tractors Hystat**

Code **TM62**

Course Length . . . . . **2 Days**

Description: This course is designed to provide technicians with specific information for the Hydrostatic Drive System on Track Type Tractors. This course covers component identification, function, system operation, and testing and adjusting.

Skills/Topics taught:

- Locate, identify, and give the function of the hydrostatic drive system components
- Use ET to calibrate the hydrostatic system
- Test and adjust the hydrostatic drive pressures

Prerequisites:

- Hydraulic Systems (TM28)
- Power Trains (TM40)

Required equipment:

- Safety glasses with side shields, safety (or hard-toed)
- Appropriate work clothing is required.

Course Title . . . . . Medium Track Type Tractors

Code TM47

Course Length . . . . . .3 Days

Description: This course covers the electronically controlled steering clutch, brake and transmission used on this series of machines (D6 - sized).

Skills/Topics taught:

After learning the information in this class, the participant will be able to:

- Locate and identify all major updated components and features.
- Explain the operation of the power train electronic control system.
- Explain the functions and operation of the priority valves, the transmission control valve group, and the steering clutch and brake valve group.
- Explain the functions of the implement hydraulic pump and control valves.
- Explain the function of the Caterpillar Monitoring System.
- Install and retrieve information using Caterpillar Electronic Technician (E.T.).
- Calibrate sensors using the appropriate service tool.

Prerequisites:

- Power Trains (TM40)
- Hydraulic Systems (TM28)
- Electricity (TG01)

Required equipment:

- Safety glasses with side shields, safety (or hard-toed) shoes
- Appropriate work clothing is required.

Course Title . . . . . Large Track Type Tractors

Code TM47L

Course Length . . . . . 3 Days

Description: This course covers the electronically controlled steering clutch, brake and transmission used on this series of machines (D8 / D9).

Skills/Topics taught:

After learning the information in this class, the participant will be able to:

- Locate and identify all major updated components and features.
- Explain the operation of the power train electronic control system.
- Explain the functions and operation of the priority valves, the transmission control valve group, and the steering clutch and brake valve group.
- Explain the functions of the implement hydraulic pump and control valves.
- Explain the function of the Caterpillar Monitoring System.
- Install and retrieve information using Caterpillar Electronic Technician (E.T.).
- Calibrate sensors using the appropriate service tool.

Prerequisites:

- Power Trains (TM40)
- Hydraulic Systems (TM28)
- Electricity (TG01)

Required equipment:

- Safety glasses with side shields, safety (or hard-toed) shoes
- Appropriate work clothing is required.

Course Title . . . . . **Introduction to Dozer Operation**

Code **TO03**

Course Length . . . . . **5 Days**

Description: This course will cover the safety hazards associated with dozer operations, becoming familiar with dozers, and basic earth moving techniques.

Skills/Topics taught:

Upon completion of this course; the participants will be able to describe, or perform, the following.

- The characteristics of a good operator
- Reasons for practicing job safety
- Rules for job safety
- Machine safety
- Basic setting and reading grade
- The pre-operation inspection
- Instruments and controls
- Machine start up
- Operating techniques, straight dozing, slot dozing, stockpiling, ripping, and backfilling

Prerequisites:

- A desire to learn the operation of heavy equipment

Required equipment:

- Safety glasses with side shields and safety (or hard-toed) shoes are required.
- Appropriate work clothing is required.

Course Title . . . . . "K" Series Track Type Tractors

Code TM75

Course Length . . . . . .3 Days

Description: This course is designed to provide technicians with specific information for the Hydrostatic Drive System on the K Family Track Type Tractors. This course covers component identification, function, system operation, and testing and adjusting.

Skills/Topics taught:

- Locate, identify, and give the function of the hydrostatic drive system components
- Use ET to calibrate the hydrostatic system
- Test and adjust the hydrostatic drive pressures

Prerequisites: Participants attending this course should have successfully completed:

- Power Trains (TM40)
- Hydraulic Systems (TM28)

Required equipment:

- Safety glasses with side shields, safety (or hard-toed) shoes
- Appropriate work clothing is required.

Course Title . . . . . "N" Series Track Type Loaders

Code TM76

Course Length . . . . . 3 Days

Description:

This course covers all the "N" Series Track Type Loaders (953N, 963N, 973N) electronic controlled hydrostatic drive systems and the implement system.

Skills/Topics taught:

Upon successful completion, the participant will be able to:

- Trace the oil flow of the hydrostatic drive system and implement system on a schematic
- Adjust pressure settings on the hydrostatic drive system and implement system
- Perform all the calibrations of the hydrostatic system controller
- Diagnose faults and take measurements on the electronic and hydraulic systems for the hydrostatic drive systems

Prerequisites: Participants attending this course should have successfully completed:

- Hydraulic Systems (TM28)
- Electricity (TG01)

Required equipment:

- Safety glasses with side shields, safety (or hard-toed) shoes
- Appropriate work clothing is required.

Course Title . . . . . Track Type Tractors (undercarriage)

Code TM48

Course Length . . . . . 2 Days

Description: This course is designed for the apprentice technician. This course will cover the parts, purpose of those parts, the operation of those parts and how to test and adjust the undercarriage of Track Type Tractors, Track Loaders and Excavators. This course covers both low sprocket and elevated sprocket machines.

Skills/Topics taught:

Upon successful completion of this course, the participant will be able to identify the parts of the undercarriage, their purpose, how the undercarriage works and wears, and proper test and adjust procedures.

Prerequisites:

- None

Required equipment:

- Safety glasses with side shields, safety (or hard-toed)
- Appropriate work clothing is required.

Course Title . . . . . ICM and ECPC Transmissions

Code TM45

Course Length . . . . . 3 Days

Description: This course covers the Individual Clutch Modulated (ICM) transmissions and Electronic Clutch Pressure Control (ECPC) transmissions used on the current off-highway trucks (770, 773 & 777) and wheel tractor scrapers (621, 631, 651, etc.). These transmissions use solid state switching controls for shifts.

Skills/Topics taught:

Upon Completion of this course the participant will be able to identify, describe, or perform the following:

- System operation
- Testing and adjusting
- Power flow through the planetary gear sets
- Flow of oil through the system
- Location of pressure gauge connections
- Electrical switch control operation
- Troubleshooting technique
- Tool requirements
- Safety
- Trace the current flow through the electronic schematics
- Hook up and use the electronic diagnostic tools (ECAP, Laptop computer with Electronic Technician program and digital multimeters
- Describe the operation of the control, switches and sensors
- Program the controller
- Troubleshoot the controller, switches and sensors

Prerequisites: It is recommended that participants attending this course have successfully completed:

- Electricity (TG01)

Required equipment:

- Safety glasses with side shields, safety (or hard-toed)
- Appropriate work clothing is required.

Course Title . . . . . Power Trains

Code TM40

Course Length . . . . . 5 Days

Description: This course is designed to give knowledge and understanding of power train principles, components, functions and systems used on Caterpillar machines. The participant will acquire skills required to identify, adjust, maintain and troubleshoot power train systems, such as track type tractors, wheel loaders, motor graders and wheel tractor scrapers during classroom and lab activities.

Skills/Topics taught:

Upon completion of this class, participants should be able to:

- Have an understanding of basic power transmission principles
- Identify various power train components
- Explain the function of various power train components
- Locate power train component test specifications for troubleshooting and test procedures
- Have an understanding of power train troubleshooting and testing techniques
- Perform proper power train test procedures

Prerequisites:

- None

Required equipment:

- Safety glasses with side shields, safety (or hard-toed) shoes are required.
- Appropriate work clothing is required.

Course Title . . . . . **Powershift Transmissions**

Code **TM13**

Course Length . . . . . **2 Days**

Description: This course will be taught in the classroom. Materials will cover powershift transmission principles and skills needed to locate and correct malfunctions in the powershift transmissions of Caterpillar machines.

Skills/Topics taught:

The overall objective of this course is to help the technician understand the theory and reasoning behind the testing and troubleshooting procedures found in the service manuals.

Prerequisites:

- None

Required equipment:

- Safety glasses with side shields, safety (or hard-toed) shoes
- Appropriate work clothing is required.

Course Title . . . . . **Powershift Transmission Troubleshooting**

Code **TM52**

Course Length . . . . . **2 Days**

Description: This class will cover troubleshooting procedures for mechanically selected powershift transmissions used on Track Type Tractors and Wheel Loaders.

Skills/Topics taught:

After successful completion of this class, the participant will be able to:

- Diagnose problems related to P1 & P2 pressures
- Diagnose problems related to torque converter pressure & flow
- Diagnose problems related to transmission/torque converter overheating

Prerequisites:

- Powershift Transmissions (TM13)

Required equipment:

- Safety glasses with side shields, safety (or hard-toed) shoes
- Appropriate work clothing is required.

Course Title . . . . . **Petroleum Transmission**

Code **TM81**

Course Length . . . . . **3 Days**

Description: This class will cover understanding and troubleshooting Individual Clutch Modulated (ICM) transmissions and Electronic Clutch Pressure Control (ECPC) petroleum transmissions.

Skills/Topics taught:

After successful completion of this class, the participant will be able to:

- Understand the operation of each component in the transmission system
- Trace the flow of oil through the transmission controls and clutches
- Understand the proper start-up, operation and shut down of the transmission system
- Demonstrate the ability to test and adjust the transmission clutches
- Demonstrate the ability to perform sensor checks, testing and adjusting of solenoids and the electrical systems
- Perform troubleshooting techniques using electronic diagnostic tools to analysis the controller, switches and sensors

Prerequisites:

- None

Required equipment:

- Safety glasses with side shields, safety (or hard-toed) shoes
- Appropriate work clothing is required.

Course Title ..... **Advanced Wheel Loader Operator Training**

Code **TO08**

Course Length ..... **4 ½ Days**

Description: This course is intended for the individual who has the basic skills of operating a Wheel Loader. Throughout this course, the following information will be taught:

The safety hazards associated with Wheel Loader operations
Wheel Loader operating techniques

Skills/Topics taught:

Upon completion of this course, the participants will be able to perform the following:

- Reasons for practicing job safety
- Rules for job safety
- Machine safety
- Setting and reading slope ratio and rising and falling grades expressed in %.
- The pre-operation inspection (review)
- Machine start up (review)
- Operating techniques:
    - Leveling and digging to grade
    - Building ramps
    - Working in confined areas
    - Working in unstable soils and mud
- Machine parking and shut down (review)

Prerequisites:

- The student should have successfully completed the Introduction to Wheel Loader course or have an experience level in the operation of Wheel Loader to pass the **pre-test with a proficiency rate of 80%.**
- Have a basic knowledge of setting and reading grade.

Required equipment:

- Safety glasses with side shields and safety (or hard-toed) shoes are required.
- Appropriate work clothing is required.

Course Title . . . . . Hydrostatic Wheel Loader

Code TM31

Course Length . . . . . 1 Day

Description:

This course covers the Implement Hydraulic System and Hydrostatic Drive System for the 914G Wheel Loaders.

Skills/Topics taught:

Participants should be able to:

- Trace the oil flow through the Implement Hydraulic System
- Hook up test gauges and take pressure readings on the Implement Hydraulic System and do diagnostics
- Trace the oil flow through the Hydrostatic Drive System
- Hook up test gauges and Electronic Controller diagnostic tools to the Hydrostatic Drive System to do trouble shooting and make adjustments.

Prerequisites: Participants attending this course should have successfully completed:

- Electricity (TG01)
- Hydraulic Systems (TM28)

Required equipment:

- Safety glasses with side shields, safety (or hard-toed) shoes
- Appropriate work clothing is required.

Course Title . . . . . **Introduction to Wheel Loader Operation**

Code **TO07**

Course Length . . . . . **5 Days**

Description: This course will cover the safety hazards associated with loader operations, becoming familiar with loaders, and basic earth moving techniques.

Skills/Topics taught:

Upon completion of this course; the participants will be able to describe, or perform, the following.

- The characteristics of a good operator
- Reasons for practicing job safety
- Rules for job safety
- Machine safety
- Basics of setting and reading grade
- The prep-operation inspection
- Machine start up
- Operating techniques, loading and dumping the bucket, traveling with a loaded bucket, stockpiling, loading trucks, basic cutting and filling
- Machine parking and shut down

Prerequisites:

- A desire to learn the operation of heavy equipment

Required equipment:

- Safety glasses with side shields and safety (or hard-toed) shoes are required.
- Appropriate work clothing is required.

Course Title . . . . . **Medium Wheel Loaders 950 – 980**

Code **TM94**

Course Length . . . . . **4 Days**

Description: This course will cover electronic shift powertrain and electronic implement hydraulics. Students will perform testing and adjusting procedures.

Skills/Topics taught:

Upon Completion of this course the participants should be able to identify, describe, or perform the following:

- Locate and identify components
- Trace oil flow through they stems
- Perform testing and adjusting on the powertrain
- Implement hydraulics, steering and electrical systems
- Perform a line relief valve pressure test
- Perform the calibration procedure

Prerequisites: Participants attending this course should have successfully completed:

- Electricity (TG01)
- Powershift Transmissions (TM13)

Required equipment:

- Safety glasses with side shields, safety (or hard-toed) shoes
- Appropriate work clothing is required.

Course Title . . . . . **Operator & Safety Training for Wheel Loaders with Forks**

Code **TS01**

Course Length . . . . . **1 Day**

Description: This course is intended as a refresher for the operators who are experienced in the operation of small Loaders with forks.

Skills/Topics taught:

- Reasons for practicing job Safety
- Rules for job Safety
- Machine Safety
- Pre -Operation Inspection
- Machine start up
- Instruments and controls
  - Moving the machine
  - Balance points
  - Picking up a load
  - Traveling with a load
  - Loading trucks
  - Stacking material
  - Machine parking and shut down

Prerequisites:

- Must be experienced in the operation of small Loaders with forks.

Required equipment:

- Safety Glasses and Safety Shoes
- Clothing should be suitable for a classroom, operating loaders and being outside for extended periods of time.

Course Title . . . . . **Large Wheel Loaders**

Code **TM98**

Course Length . . . . . **4 Days**

Description: This course will cover electronic shift powertrain and electronic implement hydraulics on (988/992) machines. Students will perform testing and adjusting procedures.

Skills/Topics taught:

Upon completion of this course, the participant will be able to:

- Locate and identify components
- Trace oil flow through the systems
- Perform testing and adjusting on the powertrain
- Implement hydraulics, steering, and electrical systems

Prerequisites: Participants attending this course should have successfully completed:

- Electricity (TG01)
- Powershift Transmissions (TM13)

Required equipment:

- Safety glasses with side shields, safety (or hard-toed) shoes
- Appropriate work clothing is required.

Course Title . . . . . Advanced Scraper Operator Training

Code TO13

Course Length . . . . . 4 ½ Days

Description: This course is intended for the individual who has the basic skills of operating a Scraper and the basics of setting and reading grade.

Skills/Topics taught:

Upon completion of this course the student will be able to describe, or perform the following:

- Reasons for practicing job safety
- Rules for job safety
- Machine safety
- Grade, Setting and reading slope ratio, and rising and falling grades expressed in %
- The prep-operation inspection (review)
- Machine start up (review)
- Operating techniques:
    - Cutting to grade
    - Dumping to grade
    - Building a stockpile
    - Working in unstable soils (Instruction/Discussion)
    - Loading in rock (Instruction/Discussion
- Machine parking and shut down (review)

Prerequisites:

- The participants attending this course should have successively completed the Introduction to Scraper Operation course or have an experience level in the operation of Scraper to pass the pre test with a proficiency rate of 80%.

Required equipment:

- Safety glasses with side shields, safety (or hard-toed) shoes
- Appropriate work clothing is required.

Course Title . . . . . Scrapers

Code: TM04

Length: . . . . . 3 Days

Description: This course is designed for service technicians to gain system knowledge and understanding on Caterpillar scraper systems to enhance troubleshooting skills. These systems include power train, hydraulic and electrical systems. This course concentrates on how these systems operate by using classroom instruction and hands on lab activities.

Skills/Topics taught:

- Location and function of power train components
- Proper selection of tooling and test procedures for power train components
- Location and function of hydraulic system components
- Proper selection of tooling and test procedures for hydraulic system components
- Interpretation of schematics and electrical system

Prerequisites:

- Hydraulic Systems (TM28)
- Power Trains (TM40)

Required equipment:

- Safety glasses with side shields, safety (or hard-toed) shoe
- Appropriate work clothing is required.

Course Title . . . . . **Introduction to Scraper Operation**

Code **TO05**

Course Length . . . . . **5 Days**

Description: This course is intended for the individual who has little to no experience operating a Scraper. Throughout this course, the following information will be taught, and the individual will have learned the basics of Scraper operation.

- The safety hazards associated with Scraper operations
- Becoming familiar with Scrapers
- Basic Scraper operating techniques

Upon completion of this course; the participants will be able to describe, or perform, the following.

- The characteristics of a good operator
- Reasons for practicing job safety
- Rules for job safety
- Machine safety
- Basics of setting and reading grade
- The prep-operation inspection
- Machine start up
- Operating techniques, basic loading, straddle loading, traveling, and dumping
- Machine parking and shut down

Prerequisites:

- A desire to learn the operation of heavy equipment

Required equipment:

- Safety glasses with side shields and safety (or hard-toed) shoes are required.
- Appropriate work clothing is required.

Course Title . . . . . Tandem Engine Scrapers

Code TM54

Course Length . . . . . 2 Days

Description:

This course covers the tractor transmission and the other systems, as well as the hydraulics, steering, engines, and electrical systems. A laptop computer with E.T. will be used during class for information gathering and diagnostics.

Skills/Topics taught:

On successful completion of this course, the participant will be able to:

- Locate and identify components.
- Describe the operation of the tractor and scraper transmission
- Trace the flow of oil through the systems
- Install pressure gauges and read pressures
- Use a laptop computer with Caterpillar E.T. installed to read/record data from that transmission and engines.
- Access and troubleshoot diagnostic codes retrieved with E.T.

Prerequisites:

- Electricity (TG01)

Required equipment:

- Safety glasses with side shields, safety (or hard-toed) shoes
- Appropriate work clothing is required.